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EDITED BY

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THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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MARYLLIS
EAR BOOK

1971

Crinum bulbispermum (Burm.)
Milne-Redhead & Schweickerdt
from the Transvaal, S. Africa

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CORRIGENDA

PLANT LIFE Vol. 24. 1968

Page 146, bottom of page—"Postscript—": under "Subsection I" change "Neapolitana" to "Moliana", and under "Subsection II", change "Moliana" to "Xanthoprasa".

Page 151, 3rd paragraph, 3rd line, change "(2n=24)" to "(2n=48)".

Page 152, 5th line from bottom, change "2n=24 (tetraploid)" to "2n=48 (octoploid)".

[See also PLANT LIFE Vol. 25. 1969, pages v—vi.]

CORRIGENDA

Traub, Hamilton P., Lineagics. 1964

Page 14, bottom of paragraph, 2nd line, and 5th line, change "Mauterpuis" to "Maupertuis".

Page 18, 2nd line, change "332" to "322".
12th and 16th lines, change "Mauterpuis" to "Maupertuis".

Page 19, under "1865", 1st line, change "ingetitance" to "inheritance".

Page 22, under "1963",—(d), change "Maryr" to "Mayr".

Page 26, 12th line, change "cretaceins" to "cetaceans".

Page 27, Table 1, at end of 2nd line delete "the".
Table 1, II, 5th line, change "cretaceans" to "cetaceans".

Page 33, 6th line from top, change "1662" to "1622".

Page 34, 10th line from bottom, change "1660" to "1690".

Page 35, center page, change "Mauterpuis" to "Maupertuis".

Page 36, 3rd and 7th lines from bottom, change "Mauterpuis" to "Maupertuis".

Page 37, 10th line from top, and 7th line from bottom, change "Mauterpuis" to "Maupertuis".
Heading "(B)", change "ANDANSONIAN" to "ADANSONIAN".

Page 46, 2nd and 12 lines, change "Mauterpuis" to "Maupertuis".
6th line from bottom, change "Russell" to "Russel".

Page 48, under "(3) Linordination" change "Wilheim" to "Wilhelm".

Page 50, Table 10, 4th line, change "Thompson" to "Thomson".

Page 53, 3rd. paragraph, 9th line, after "acceptible" add "group".

Page 58, 1st line, change "Mauterpuis" to "Maupertuis".

Page 61, from bottom, end of 17th line, and beginning of 16th line, change "function" to "functions".

Page 62, Fig. 2, 3rd and 4th lines, change "meterology" to "meteorology"; and change "mathematices" to "mathematics".

Page 64, 13th line, change "basic" to "basis"; 17th line, change "fall" to "falls".

Page 69, 14th line, from bottom, change "lin(age)" to "lin(eage)".

Page 92, 5th line from bottom, change "venleestenii" to "vanleestenii".

Page 96, 3rd line from bottom, change "includs" to "includes".

Page 97, 4th line from bottom, after "closely" add "to".

Page 99, Table 15, align "5a" with "(b) impediolinon"; and change the second "5a" to "5b" and align with "(c) desinolinon".

Page 100, 3rd line, change "symparty" to "sympatry"; and middle of page, under "Procaryotae", 2nd line, after "due" add "to".

Page 102, 2nd line from bottom, change "12" to "13".

Page 103, 1st paragraph, 11th line, change "inclusive" to "inconclusive".

Page 107, 1st paragraph, 7th line, change "are" to "is".

Page 108, last paragraph, 2nd line, after "often" add "of".

Page 112, 1st line, change "Methanabacae" to "Methanobacae"; and under "(C)", 2nd Paragraph, after 5th line, insert missing line, "autotrophs, known as obligate autotrophs, obtain their nutrition".

Page 115, 2nd paragraph, 12th line, change "1848" to "1948".

Page 117, below Table 21, 2nd line, change "Spirochetebacae" to "Spirochetobacae"; and in the following paragraph, 6th line, after "from" insert "the".

Page 121, 5th line from bottom, after "with" insert "the".

Page 123, 5th line, after "pointed" insert "out", and in 4th paragraph, center, 6th line after "(1957, 1962)" add "(b)".

Page 126, under "THE HIERARCHIC TAXA", end of first line change "were" to "was"; and 11th line from bottom, insert comma "," between "order" and "class".

Page 127, 2nd line from top, delete "that"; and 21st line from top, change "of" to "or".

Page 129, 3rd paragraph, 2nd line, change "are" to "is".

Page 132, 1st paragraph, last line, after "Andrews et. al", insert "Virol".

Page 133, Middle of page, paragraph beginning with "Phylum 8. , , ,", 1st line, change "red-shaped" to rod-shaped".

Page 138, under "SUBKINGDOM 3. ANIMALIA", 6th line, change "subkingdom" to "infrakingdom".

Page 141, "Table 27" next line, change "Superphylum" to "Superkingdom".

Page 142, under "Phylum 5 . . ." "Family 1" change "(Chloronium) to "(Chlorobium)"; and under "Phylum 6 . . .", "Class 2, Order 1, Family 1", change "(Phodopseudomonas)" to "(Rhodopseudomonas)".

Page 145, after "Infrakingdom 2.", change "EUMACOTAE" to "EUMYCOTAE".

Page 150, under "(b) CONVERSION FROM LINES, etc.", 1st column, 2nd line from bottom of table, change "30.45" to "30.48".

Page 155, after entry, "Just, T. etc.", insert entry, "Keith, The Theory of Human Evolution. 1949"; and after "Lees, H. etc.", end of line, add "Lectures, 1961-62."; and under, "Lewis, Harlan, etc.", 3rd line, delete, "Lectures, 1961-62".

Page 157, after entry, "Rothmaler, W., etc.", insert new entry, "Royal Society, The, of London, Notes and Records 14: No. 1. 1959."; and 2nd to last line from bottom, change "becterium" to "bacterium".

Page 162, 20th line from top, change "Mauterpuis" to "Maupertuis".

PLANT LIFE, VOL. 27, NO. 1, January, 1971

AMARYLLIS
YEAR BOOK
1971

Year Book of
The American Amaryllis Society
38th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 153.]

PREFACE

Again, we are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for a beautiful cover design based on *Crinum bulbispermum.* The reader is referred to a short note in the text about this interesting and valuable plant.

The 38th edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Carlos Gomez Ruppel, who received the WILLIAM HERBERT MEDAL for 1971 in recognition of his outstanding amaryllid explorations in Argentina, Brasil and Chile over a period of years. He is an eminent scientist and the best of ambassadors of good will for Latin America since he has generously shared his plant treasures with enthusiasts in the United States and other parts of the world.

In this issue, Dr. Ruppel gives us a charming autobiography, and an article about two of his amaryllid collecting trips into Chile.

Mr. Leon Boshoff-Mostert contributes an interesting South African Letter.

Dr. Martin Cardenas writes about Bolivian amaryllids, and names a new *Amaryllis* species in honor of the late Ira S. Nelson; Dr. Whitaker reports on a collecting trip for *Amaryllis* in the Bolivian Yungas.

Mr. Doran gives us the first picture of the hard, round seeds of *Amaryllis reticulata* which so baffled the late, great William Herbert, who dreamed about them in print before he had seen the ripe seeds, thus creating much confusion among those who follow nomenclature as an end in itself.

Prof. Ravenna contributes the fourth in his series on the Amaryllids of South America; and also reports on new Latin American amaryllids.

The members will be particularly interested in the reports on Amaryllis chromosomes and the anthocyanin pigments of the Amaryllis flower, by a group of researchers at Louisiana State University, Baton Rouge. It is hoped that these researches will be continued since such information is very much needed.

Prof. Adee writes about an Ecuadorean amaryllid, and the year round of Amaryllid blooms in limited greenhouse space in the North.

Dara Emery reports on a long-lived Amaryllis hybrid: and Messers. Mertzweiller and Buchmann write about their Amaryllis breeding programs. Mr. Fesmire considers the growing interest in smaller hybrid Amaryllis. Mr. Bleakley informs us about Amaryllis in Australia.

Mrs. David E. Wilson, the daughter of Mrs. Morris Clint, writes about an amaryllid collecting trip into Mexico, thus following in her mother's footsteps.

Mr. Williams reports on the amaryllids he has received from the collections of Dr. Ruppel in South America; Mr. Buck summarizes the 1970 Daylily season; Mr. Hugh Bush and Mr. Tisch write about their experiences with amaryllids.

Mrs. Pahls reports on the charming *Eurycles amboinensis;* and Mr. Buck gives details for storing *Clivia* seeds.

Mrs. Pickard reports on the American Amaryllis Society's study course for the Amaryllis Judge's Certificate.

There are reports on the 1970 Amaryllis shows, and various other interesting contributions as shown in the Table of Contents.

Contributors to the 1972 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1971, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.*

December 15, 1970
2678 Prestwick Court,
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Hamilton P. Traub
Harold N. Moldenke

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SUCCULENTS AND CACTUS, by the Sunset Editors and Jack Kramer. Lane Books, Menlo Park, Calif. 94025. 1970. Pp. 80. Illus. Paper covers. $1.95. This charming, profusely illustrated treatise on succulents and cactus will be welcomed by the gardening public. After an introduction to the nature of these amazing plants, the sections are devoted to starting a collection; caring for succulents and cactus; indoor culture; landscaping ideas; propagating techniques; problems encountered; specialties, and an index. Very highly recommended to the gardening public.

IN PRAISE OF ROSES, by Harry Wheatcroft. Henry Regnery Co., 114 W. Illinois St., Chicago, Ill. 60610. 1970. Pp. 192. Illus. $12.50. This charming book is like a breath of fresh air and a ray of sunshine. The 160 color prints, and 77 black and white illustrations are worth more than the price of the book. The author brings a half century of experience with roses and acquaintances with rose breeders to bear in discussing the greatest roses in his life, how new roses are bred, heredity, sports, scented roses, climbers and ramblers, blue roses, red and yellow roses, the American rose industry, etc. An important feature of the book is the section devoted to Harry Wheatcroft rose selections covering 58 pages—hybrid teas, floribundas, climbers, shrubs and miniatures. Indices of varieties (clones), and names and places, complete the volume. Very highly recommended to all gardeners.

BOUQUETS THAT LAST, by Emily Brown Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1970. Pp. 176.+32 color plates. $10.00. This very attractive book represents a comprehensive guide to the making of long lasting arrangements, including the collection, cutting, conditioning, drying and preserving the floral and vegetative parts of garden, wayside, seashore and mountain plants. The outstanding features of the book are the 32 color plates presenting 73 compositions, in full color, and the long descriptive list of plants suitable for making bouquets that last. Highly recommended to flower arranger, home decorator and artist.

PLANT PATENTS; WITH COMMON NAMES, 2208 THROUGH 2855. 1963—1968. Publ. by the American Association of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. 1969. Pp. 23. $1.00. The subject matter is arranged under three parts: I. Numerical listings; II. Alphabetical listings, and III. Alphabetical listings of names and addresses of originators or discoverers and assignees. All plant patents through 1159 have expired as of December 1969, and become public property. The present Directory superseded the 1963 through 1967 supplements to the Directory. Annual supplements will be discontinued. Hereafter supplements will be published every 5 years.

RECENT ADVANCES IN PHYTOCHEMISTRY, VOL. 3, edited by Cornelius Steelink and V. C. Runeckles. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 268. Illus. $14.50. This is the third annual volume prepared under the auspeces of the Phytochemical Society of North America, and presents papers by outstanding authorities under the general theme, "Phytochemistry and the Plant Environment". The first three chapters are concerned with the chemical responses of plants to elements of their chemical and physical environments. The interactions between higher plants and other organisms are taken up in most of the remaining chapters. This timely book is very highly recommended to all interested in phytochemistry, and biology.

Dedicated to
Carlos A. Gomez Ruppel

EVOLUTIONARY BIOLOGY, edited by T. Dobzhansky, M. K. Hecht and W. C. Steere. Under this title a hard cover book is published annually devoted to critical reviews, commentaries, and original papers on all aspects of evolutionary biology.

VOLUME 3. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 309. Illus. $18.00. The papers in this volume are concerned with cancer cells as temperature sensative mutants; origin of mammals; comparative ecogenetics of two **Avena** species in Central California; evolution of social bees; sexual selection in **Drosophila**; defenses against visually hunting predators; and evolution in parthenogenetic **Curculionidae.**

VOLUME 4. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 312. Illus. $16.00. The papers in ths volume are concerned with diverse approaches to systematics; the meaning of adaptation and its relation to natural selection; the usefulness of amino acid and nucleotide sequences in evolutionary studies: on the evolution of substrate control in differentiation; natural regulation of plant species diversity; lichen symbiosis; **Drosophila** viruses and their role as evolutionary factors; evolutionary interactions between species of North American salamanders in the genus **Plethodon**; and evolution of human threat display organs.

Each of these two volumes is provided with an author and subject index. The two volumes are highly recommended to all interested in biology.

PLANT LIFE LIBRARY—continued on page 140.

HERBERT MEDALIST—CARLOS A. GOMEZ RUPPEL

CARLOS A. GOMEZ RUPPEL

An Autobiography

I am the son of Carlos Gomez and Emilia Elvira Ruppel, and was born on July 7, 1909 in San Juan City, Capital of the Province of San Juan, Argentina.

Being very fond of Nature since my earliest recollections, I take a very keen interest in all its forms. From my early childhood I made long and patient observations of Nature's simplest manifestations. At first the larger specimens of our Fauna did not attract my attention very much, at least not to the point that small birds, doves, amphibians, and reptiles in general did. Grass snakes soon became the target of my hobby. I was lucky, however, in having then lived in an area lacking poisonous snakes or vipers.

But, possibly due to my knack of catching and observing Arthropoda (as a child I, of course, called them ''bichos'', that is to say ''bugs''), they were rather victimized by me. ''Wars'' between ants of different species or tribes provided my infantile spirit untold hours of exciting observations, and how fascinating it was to spend the time watching fights between red wasps (genus *Pompillus)* and spiders which, many a time, were considerably larger than their tormentors. The wasp's agility and astuteness infallibly accounted for its victories. Just one sting was quite sufficient: in only a few seconds the poor spider, under the effects of the poison, started to tremble and very soon became completely paralyzed. The wasp would then start to drag its heavy load to its quite often distant underground cave, where the archnidian's body juices would serve as nourishment to the larvae of the *Pompillus.*

Is it strange then that with these inclinations and with the partnership of a girl cousin of my own age, we should undertake building up a ''natural history museum''? At first it was merely limited to Zoology. We used to stuff birds and ''prepare'' snakes and lizards in ethylic alcohol, and so on. But, what became our outstanding feature was our collection of insects, a task placed in my charge. My age at the time was around 7 or 8 years old, my hobby lasting until I was 10—in San Juan—when Father, an officer of the National Mortgage Bank's branch, was transferred to the Mendoza City branch; bringing with it a better position. Consequently, I had to give up my share in the ''museum'' though not entirely, for my entomological cases came along with me.

Shortly after our arrival in Mendoza City, I discovered the ''Juan C. Moyano'' Natural History Museum, with its splendid collections where I spent many a joyful hour in deep contemplation. Therefore it is not strange to say that as soon as I got the chance I introduced myself to the famous Dr. Charles S. Reed, its scientific director; a most charming gentleman. When informed of my fondness of Nature

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he invited me to collaborate with him in the entomological department. I forthwith accepted with alacrity and devotionally worked for many years with Dr. Reed, acquiring ability, dexterity, knowledge, and a very practical experience under his expert guidance and kind tutorship.

During their course in Zoology at the National College (high school) students had to present an entomological box as part of their duties. But, how was one to get insects in Winter? (classes here start around the end of fall). A neighbouring student, aware of my activities, begged my collaboration. I helped him with pleasure and prepared a small case for him, which well fulfilled his needs but, oh my stars! how soon I found myself involved with several students who came with the same requirements. Later on more and more turned up, ad infinitum.

Father's financial help was limited to my bare essentials. So after cudgelling my brains for a more affluent state of affairs it became obvious that the sale of well prepared and classified insects could be a good source of income. By charging 3 pesos (about u$s 2.30 at the then rate of exchange) for a case of about 30 specimens, I soon sold out my entire collection. I can recall earning 50 pesos (around u$s 38.50) a very large sum for me at the time, as with that money it was possible for me to go to Buenos Aires and spend my three-month's holiday at my grandmother's who was living in Nuñez, a few blocks away from the River Plate.

At the time—I was not quite 12 years old—there were floodable areas at the riverside, where the most extraordinary Flora and Fauna (as I thought) thrived. This zone has lately been retrieved from the river and a huge football stadium has been built on it.

I was an awfully happy boy spending my vacations there and my collection of insects soon exceeded my needs and made available a surplus for new sales to defray the expenses for further travels.

And so several years went by during which time I finished my secondary studies and had to make up my mind about the University career I should take up. As there were not many careers to choose from at the time, my parents recommended my taking up Medicine, possibly due to my inclinations.

So I enrolled at the La Plata Faculty of Medical Sciences where—in my second year—I obtained the job of paid helper in the Biological Chair, a post I was able to hold till the end of my studies and which greatly helped to solve my need for living expenses.

While a graduate student I specialized in allergy, attracted by its persevering correlation with plants, and my need for a doctorate thesis, which in February 1942, "Contaje de Polenes Anemófilos en La Plata" (Pollen Count in La Plata) won my professors' praise.

Having set up my practice in Mendoza, I soon joined the medical corps of the "Allergy Center." There I led a very fortunate time, as within a few years I became—through a competitive contest among other doctors—the Center's head, a post equivalent to that of a Chief of "Mixed Services", the highest post attainable in this country's medical roster; one which is not easily obtained as postulating doctors must first request their retirement.

Always inclined to teaching, but lacking the specific teacher's degree, and having practiced many sports, I took up coaching, either successively or simultaneously, in such fields as swimming, mountaineering, skiing, skating, gymnastic exercises on the larger apparatus, etc.

I could have aspired to a Chair in the Faculty of Medical Sciences but I felt better fitted—and prefer—Chairs in secondary Schools where the youth give one a better chance to make a good job for their total formation.

Having obtained the chance of becoming Deputy Professor in the two-hour-a-week Chair of Hygiene, in 1951, I joined the staff of teachers and henceforth my onward path grew smoother and smoother. By the end of that same year I had gotten a sixteen-hour-a-week job, Shortly after this number of weekly hours of teaching I was lecturing 36 hours a week in three shifts. Quite understandably I found myself in a condition of incompatibility and had, either to resign to 12 hours of teaching or else resign my chieftainship in the Allergy Center. Though it may well seem inconceivable, the latter resignation was my choice and henceforth I no longer practiced as a doctor; becoming, exclusively, a professor in botany, zoology, anatomy and hygiene.

Under this stress I got a cerebral thrombosis in 1965 which, greatly to my annoyance, compelled me to ask for retirement; a request that was granted in 1968.

During the 1950's—I cannot recollect the date exactly—I started corresponding with Mrs. Marjorie S. Anthes of Encinitas, California, U.S.A., and which happy event largely influenced my future activities. This friendship yielded me a pleasant alliance.

In one of her letters, Mrs. Anthes said that "it seems incredible that your countrymen have not paid any attention whatever to the numerous species of Amaryllids which there grow so abundantly. The United States does not have them, but we heartily desire having them."

As may be inferred from the aforesaid, I took up collecting every interesting plant I came across during my excursions. A few Amaryllids were nursed at home and, with a few more that I hunted, a parcel of them was sent to Mrs. Anthes. Thanks to this friendship I made a few other contacts and these, in turn, brought me many others.

Several years went by and interest in wild plants began to increase as well as the number of correspondents all over the world. The zones of my raids increased exceeding the boundaries of my country. I got collections in Paraguay and Brazil where every single trip offered me remarkable new discoveries.

Groups of interested parties were formed in the U. S., groups that helped to finance these trips, for—as stated above—I am not a man of means. To all of those who have partaken in one way or another I here wish to express my sincere gratefulness, particularly so to those from California who were so enthusiastic with the material from my collections.

The West-central Argentine zone is relatively rich in species of the genus *Rhodophiala* and a few *Zephyranthes*. But, informed that the northern Argentine zone and the bounding ones contained a larger representation with many species of the genera *Amaryllis, Habranthus. Hieronymiella* (see Fig. 2), *Alstroemeria*, etc., I aimed my search in this direction, and was agreeably rewarded for my pains with interesting discoveries.

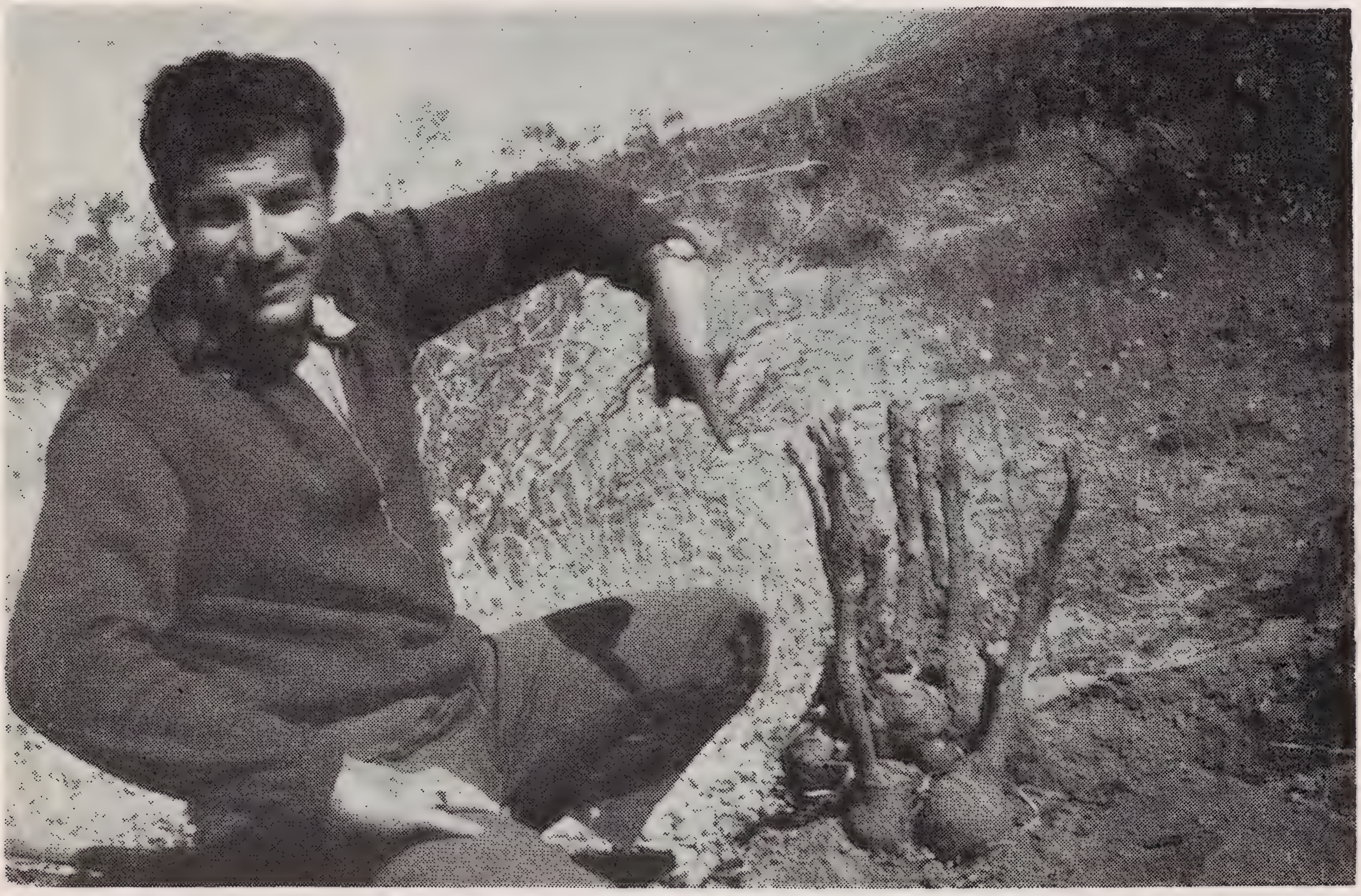

Fig. 2. **Hieronymiella aurea** Rav., showing bulbs collected by Dr. Ruppel and Sr. Y. Yanello at Zim-Zim, Salta, Argentina. Sr. Yanello appears in the picture. Photo by Dr. Ruppel.

My enthusiasm for the subtropical zones made me overlook Chile, situated practically ''next door'', so to speak, to my province. This neglect was a serious mistake. About three years ago I went into central Chile for the first time and was really astounded at the abundance of species of the family *Amaryllidaceae*. Since then I have undertaken about ten excursions into this country so well favored with Nature's gifts.

There the Rhodophialas and Alstroemerias amaze one due to their variety as well as on account of their abundance. During spring one finds the fields bountifully draped with such flowers as *Alstroemeria, Rhodophiala, Leucocoryne, Placea* species, etc., etc. to the extent that one has to tread on them as if one were walking on lawns if one wishes to make headway! As soon as the rains are over, though, these veritable gardens become transformed into real deserts until the following spring.

At present, thank God, my health has been fairly restored. However, as I am no longer a young man I am distressed to think that not many years remain for me to comply, in full measure as is my wish, with my friends' requirements, nor shall I be able to give full swing to my enthusiasm. Let us trust in the Lord's wisdom Who knows what is best for us.

Casilla 370,
Mendoza, Argentina,
June 1970

1970 HERBERT MEDAL PRESENTATION TO DR. THADDEUS MONROE HOWARD, JR.

Mrs. Robert E. Herold, *San Antonio, Texas*

The WILLIAM HERBERT MEDAL for 1970 was presented to Dr. Thaddeus Monroe Howard, Jr., for his outstanding contributions to the amaryllids, notably adding to the knowledge available on *Alliums, Bessera, Sprekelia* and other genera.

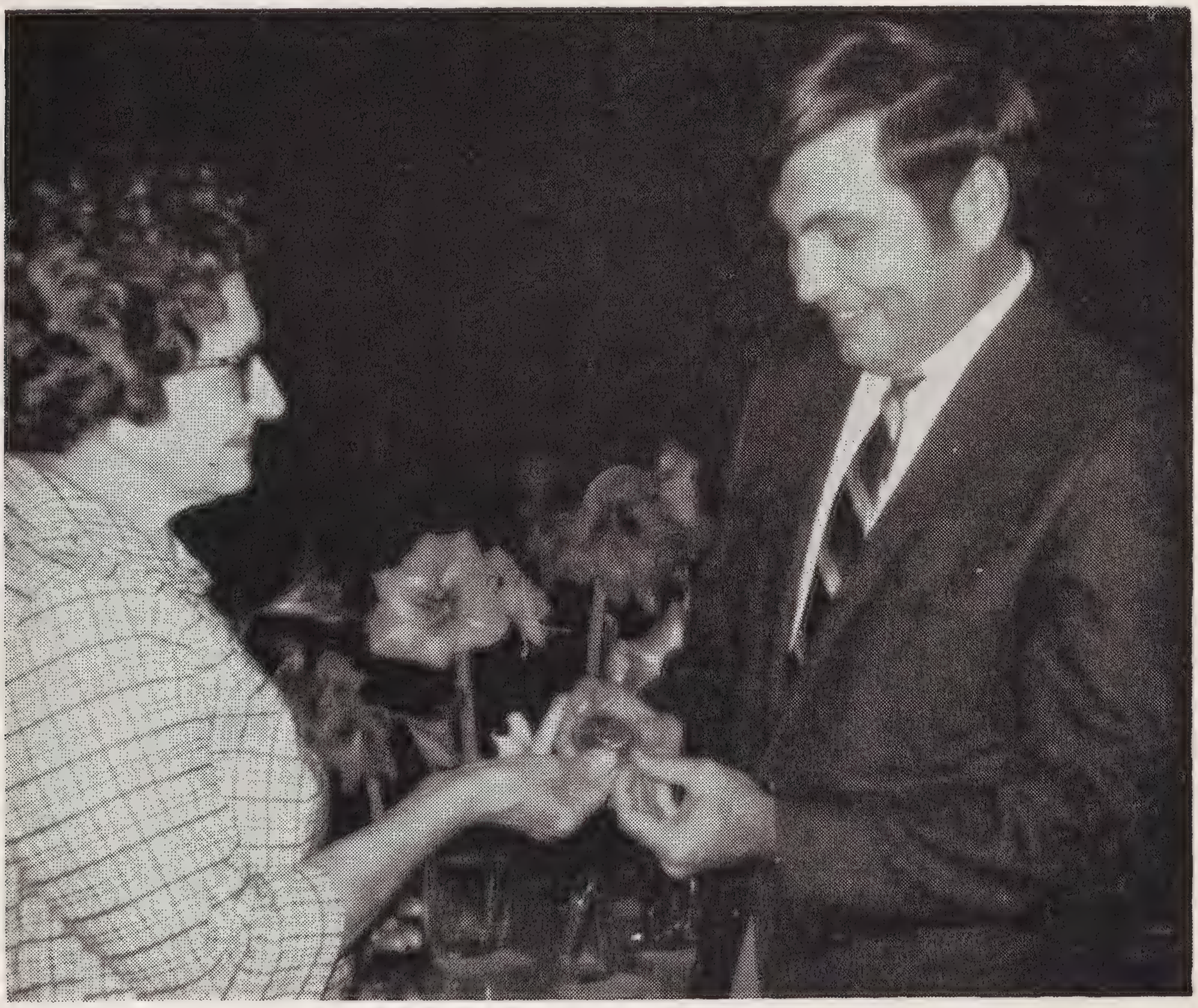

Fig. 3. Mrs. A. C. Pickard is shown presenting the 1970 HERBERT MEDAL to Dr. Thad M. Howard in award ceremonies held at the Witte Memorial Museum, San Antonio, Texas on April 13, 1970. Photo by Mrs. Robert E. Herold.

The award was given at the Amaryllis Judging School held by The Shasta Garden Club of San Antonio, Texas, Mrs. Edward T. Story, presiding, on April 13, 1970 at the Witte Memorial Museum. Mrs. A. C. Pickard, Official Amaryllis Judging Instructor from Houston, Texas read the citation and on behalf of The American Amaryllis Society presented the medal to Dr. Howard (Fig. 3).

Among those present were students of the school, members of the San Antonio Amaryllis Judges Council and invited guests.

The reader is referred to the 1970 issue of PLANT LIFE for the autobiography of Dr. Howard.

EDITOR'S MAIL BAG

Mr. J. F. Parsons, FRHS, 55 Roxburgh Road, Nuneaton, Warwickshire, England, an ''enthusiastic amaryllisarian would like to get in touch with amaryllisarians in the United States, Australia and South Africa, to exchange information and bulbs.''

Mrs. Betty C. Zorbach, under date of August 11, 1970, writes,—''I am sorry to inform you of the sudden death of Dr. William W. Zorbach late in June. As you know, he was an avid grower of Amaryllis and other amaryllids and this was one of his joys of life. We had planted many of our bulbs here at Houghton, Michigan, and many have bloomed after being wintered over in the University greenhouse.''

Dr. Zorbach and his wife Betty authored the article, ''Sucrose as the sole constituent of the Honey of *Crinum asiaticum*'' in the 1968 PLANT LIFE. He wrote reports on his amaryllid activities in several issues of PLANT LIFE. He was born June 15, 1916 and died June 28, 1970, at Houghton Technological University, where he was Professor of Chemistry. Dr. Zorbach's many friends will miss him very much.

Mrs. David E. Wilson [Marcia Clint Wilson] writes under date of August 13, 1970, ''We had a marvelous vacation trip into Mexico with mother (Mrs. Morris Clint) and she was an excellent instructor with all procedures in caring for plant material collected. She makes plant inspection as easy as possible for the U. S. Department of Agriculture and has always had a pleasant relationship over the years. When my husband picked up our bulbs the day after our return, the head of the local branch of the Department asked my husband: ''Does Mrs. Clint have these bulbs grown for her in Mexico?'' ''No'' replied my husband, ''I was the chauffeur and I can assure you we dug each one!'' See article in present issue.

Mrs. Wilson contributed the cover featuring *Zephyranthes clintiae* for the 1957 HERBERTIA which is dedicated to her mother, Mrs. Morris Clint.

Under date of September 3, 1970, Mr. Richard J. Sudd, 2568 Comstock Circle, Belmont, Calif. 94002, writes,—''My family and I have moved to California [from Des Plaines, Ill.] last year and are

EDITOR'S MAIL BAG—continued on page 128.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1970 AMARYLLIS SHOWS

The 1970 Amaryllis shows began with the Greater New Orleans Official All-Horticulture Show, and the Corpus Christi Official Amaryllis Show, on the same dates, April 11 and 12. Then followed the Official Greater Houston Amaryllis Club Show, on April 12. The Houston Official Amaryllis Show was held on April 19. The Greater Gulf (Mobile) Amaryllis Show, and the Southern California Official Amaryllis Show were held on the same dates, April 25 and 26. The Show season closed with the Hattiesburg Official Amaryllis Show, on May 9.

Mr. Fred J. Buchmann writes under date of October 15, 1970, that no Amaryllis show was held at Baton Rouge in 1970, but that an Official Show is being planned for 1971 in conjunction with the Men's Garden Club Spring Show.

It should be noted that at the Official Southern California Amaryllis Show ''people still liked large bloom'' since they finally chose 'Goliath' as number one flower on the second and last day of the show. However, at the end of the first day, the outstanding new species, *Amaryllis papilio,* the Butterfly Amaryllis, reigned as first bloom.

It would be worth while to obtain show visitor's participation to vote for first, second and third blooms at all of the Amaryllis shows beginning in 1971. It would be interesting to compare the first, second and third choices for each of the regional shows. Those in charge of the 1971 shows should plan accordingly.

1970 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

Dr. Tim Calamari, Jr.,
1016 Rosa Ave., Metairie, La. 70005

The Men's Amaryllis Club of New Orleans sponsored their eleventh annual all-horticulture Amaryllis show over the week-end of April 11 and 12, 1970. For the second year in a row the Show was held at the Lakeside Shopping Center Mall. Over one thousand flower lovers viewed the Show, and many took the time to express their satisfaction with the staging as well as the quality of the horticulture to the members of the Show committee. Again this year (as in past years) one of the highlights of the Show was the competition table of single Amaryllis florets. Each year more and more Show visitors are attracted by the uniqueness of this display.

Over two hundred and fifty entries were made with almost one hundred and fifty being pot plants. Milo Virgin, Al Diermayer, and Walter Latapie won top honors in the Show. Mr. Virgin won the Walter Latapie Award with a massive 'Golden Triumphator', and a sweepstakes award for the most blue ribbons in the registered and named hybrid sections. Mr. Diermayer won the Southern Seed and Popcorn Co. Award for the best specimen in the breeder's section, the T. A. C. Construction Co. Award for the best unnamed and unregistered hybrid (a charming greenish white miniature), and a special trophy for the best single floret ('Bianca'). Mr. Latapie won the sweepstakes ribbon for the most blue ribbons in the unregistered and unnamed hybrid sections, and the President's Trophy for the most blue ribbons overall. Mr. W. J. Perrin won the James Mahan Award (the award of merit runner-up trophy) for an outstanding 'Apple Blossom'. He also received the Ludwig Challenge Cup for this flower. The 1970 Show Chairman was Mr. Vincent Peuler. Mr. Al Diermayer was Co-Chairman.

CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW 1970

Mrs. Carl C. Henny, *P. O. Box 3054,*
Corpus Christi, Texas 78404

We are glad to report that we received 93 entries for our annual Coastal Bend Amaryllis Society Exhibit this year. Our Exhibit was held in conjunction with the "Festival of Flowers" held by the Corpus Christi Council of Garden Clubs on April 11th and 12th, 1970.

Fig. 4. Mrs. Levi Materne, winner of the Ludwig Challenge Cup at the 1970 Official Coastal Bend Amaryllis Society Show, Corpus Christi, Texas, April 11, 1970.

Among the Pot-Grown Registered and named Amaryllis were 'Ludwig's Daintiness', 'Ludwig's Striped', 'Siren', 'Apple Blossom', Ludwig's Ace', and 'Flora Queen'. Entries in the Registered and Named Leopoldii Cut Scape Section were 'La Forest Morton', 'Spring Dream', 'Franklin Roosevelt', 'Apple Blossom', 'Picotee Petticoat', 'Candy Cane', 'Royal Dutch', 'Happy Memory', 'Fiesta' and 'Picotee Dutch Doll'.

The Ludwig Challenge Trophy was awarded to Mrs. Levi Materne [Fig. 4] for her entry of the greatest number of ''blue ribbon'' winners in the Ludwig Registered and Named Amaryllis Section.

A ''Special Trophy'' to a non-member was awarded to Mr. J. B. Parr, for his entry of 'Mother Queen Superior', which scored 92 points.

A ''Special Trophy''—to a Club Member—was awarded to Mrs. Carl Henny for receiving the greatest number of blue ribbons in the ''Breeder's Class''.

An ''Achievement Trophy''—Club Member: was awarded to both Mrs. Robert B. Arnold and Mrs. R. A. Hornberger for entries in the Registered and Named Leopoldii Amaryllis classes, which were blue ribbon winners.

An ''Award of Merit'' was given by the Council of Garden Clubs—to Mrs. Robert B. Arnold, for her entry of 'La Forest Morton', which scored 96 points.

''Awards of Merit'' were given by the American Amaryllis Society. affiliated with the American Plant Life Society,—to Mrs. Robert B. Arnold for her entry of 'La Forest Morton', scoring 96 points; and to Mrs. Herman Galloway for her entry of 'Picotee Petticoat', which scored 95 points.

Twenty blue ribbons, 15 red ribbons, 9 yellow ribbons, and 2 white ribbons were awarded by judges for entries in the exhibit. Judges for the exhibit were Mrs. Frank Hopwood, Mrs. Larry Miller, and Mrs. R. H. Parkinson, National Accredited Amaryllis Judges from San Antonio, Texas.

THE GREATER HOUSTON AMARYLLIS CLUB 1970 OFFICIAL SHOW

Mrs. Sally Fox,
1527 Castle Court, Houston, Texas 77006

Due to an unusually cool Spring, with most of March nights quite cold, Greater Houston Amaryllis Club members reported their amaryllis did not develop sufficiently for our scheduled show date of April 12th. Therefore, we joined the Men's Garden Club Show, which was held April 26th in the Houston Garden Center. Both shows were outstanding and were viewed by an overflow crowd since those who came to visit either one of the shows were in for a double treat.

Some of the Men's Garden Club members are also amaryllis growers and they had an attractive display with many blue ribbons attesting to their ability. The highest score in their amaryllis division went to a pink seedling, a little lighter in color than 'Fairyland' but with more compact form, which was a hybrid produced by Mr. Kermit L. Warnasch, Houston, Texas.

Due to limited space, the Greater Houston Amaryllis Club omitted their usual impressive staging, and Arrangements Chairman Mrs. G. D. Everett used a few colorful arrangements of amaryllis to high light the room.

Needless to say, the center of attention was the trophy table which held the outstanding specimens in the show, with winners as follows:

Highest award—silver tray—to Mrs. Sally Fox for 'Glorious Victory', a beautiful salmon amaryllis.

Ludwig Challenge Cup to Mrs. P. A. Froebel for 'Trixie', a large cherry red blossom.

The above two winners also received Awards of Merit from the American Amaryllis Society.

Mrs. Chas. H. Pease won a silver covered dish for the best miniature 'Black Magic' which was one of her hybrids. She received a Preliminary Commendation Award.

Mr. Kermit L. Warnasch won a silver tray for best seedling, along with a Preliminary Commendation Award. He also won the Sweepstakes Award.

Mrs. A. C. Grebe received a silver dish for an outstanding American Hybrid of unusual rose coloring.

All classes were judged by official amaryllis judges selected by the Chairman, Mrs. C. L. Mercer.

There was not sufficient room for an Educational Exhibit; however, those visiting the show who showed a bit of interest were encouraged to try their hand at growing these imposingly beautiful blossoms by the hostesses who enthusiastically explained that it actually takes very little effort to get such grand dividends.

Mrs. W. S. Wheeler acted as Show Chairman, assisted by Mrs. Sally Fox. Both felt the seedling division was one of the most popular spots in the room as the visitors viewed the new and quite outstanding blossoms which were produced by novice hybridizers.

Mrs. John H. Ellett is President of the Greater Houston Amaryllis Club and complimented the Show Chairman and her various committees for goal fulfilled—"promoting interest in growing amaryllis".

1970 OFFICIAL HOUSTON AMARYLLIS SHOW

Mrs. A. C. Pickard, *Official Show Standards Chairman,*
1702 North Blvd., Houston, Texas

The annual Amaryllis Show of the Houston Amaryllis Society held its official Spring show on April 19, 1970 at the Garden Center.

As usual we had anticipated exceptional bloom this season, however, the combination of extended cool nights and cloudy days had a serious effect on length of scape and quality of bloom.

While waiting for the garden bulbs to bloom, we were enjoying beautiful pot grown Amaryllis that were potted the first of the year; but one is never satisfied to stage a show with only those grown under controlled conditions however perfect they are.

It has been our philosophy to encourage the growing of Amaryllis in the garden. We have found this to be rewarding as each year the increasing interest among garden Amaryllidiarians that visit the show indicate they are adding more and more to their collections.

We have become a tradition for the garden minded in this region and elsewhere.

The classification of entries included the named and unnamed species from Division 1 through Division 8 with the exception of Division 2, long trumpet. Division 9, unclassified Dutch unnamed and nonregistered clones created added interest to the show.

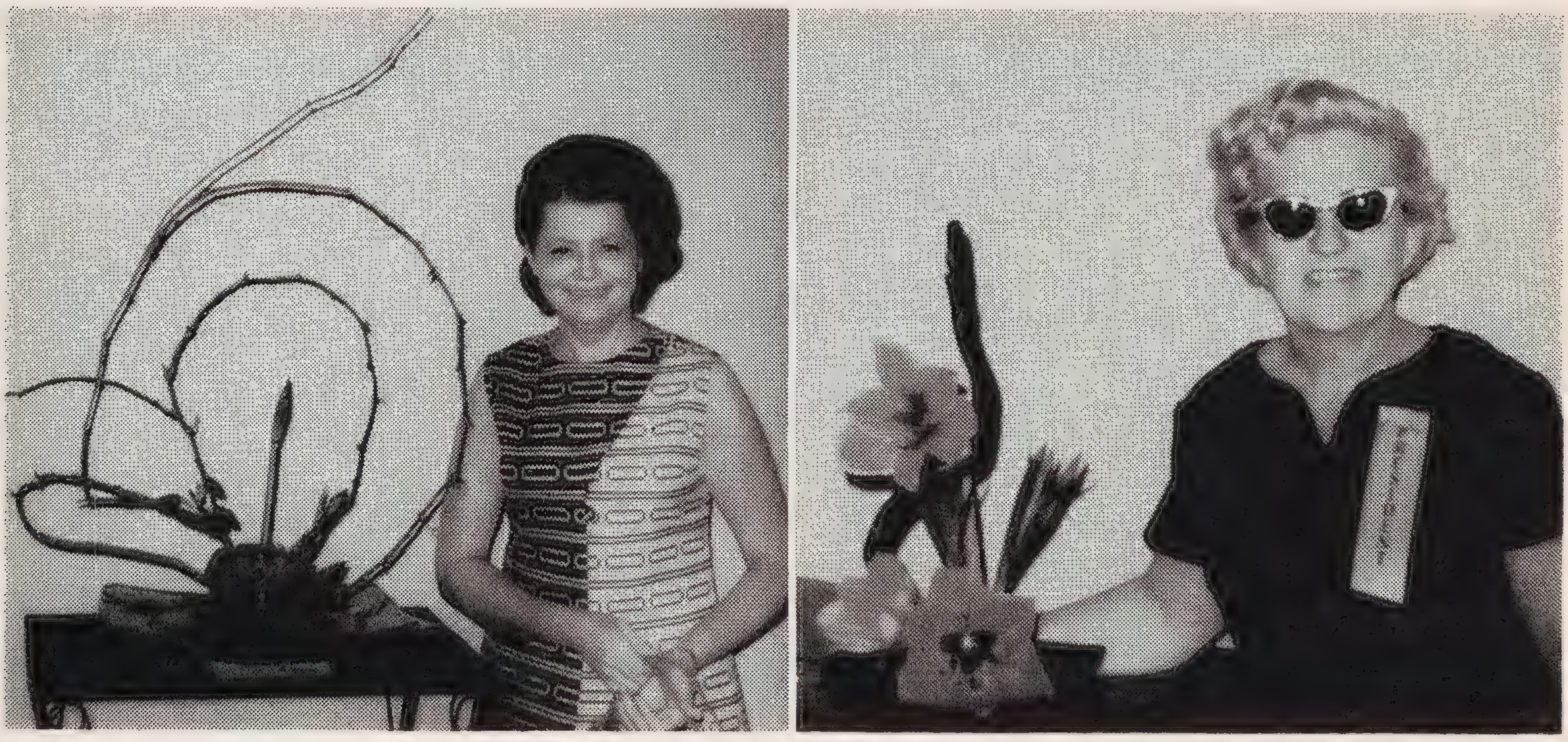

Fig. 5. Houston Official 1970 Amaryllis Show, artistic section: **Left**, exhibit by Mrs. Arnold Kitzmiller; and **Right**, exhibit by Mrs. R. S. Culpepper, President of the Houston Amaryllis Society.

The Educational section, showing the various methods of propagation encourages the new grower to try his luck at hybridizing.

For many years members of the society have been growing Amaryllis from seed and these plants coming into maturity are bringing new colors and forms into cultivation adding worthy meritorious introductions.

American Amaryllis Society award winners were:

'Apple Blossom' (cut specimen) Lud. R. #422-D. 5A—highest A.M. Mrs. L. E. Morgan.

'White Christmas' (cut specimen) V.M. R. #534-D. 5A—Mrs. Arnold Kitzmiller.

'Trixie' (potted plant) Lud. R. #706-D. 5A—Mrs. A. C. Pickard.

'Takarasuka' (cut specimen) Lud. R. #881-D. 5A—Mrs. A. C. Pickard.

'Pamela' (Miniature) (potted plant) Lud. R. #559-D. 8—Mrs. Ward H. Blair.

Breeders Class—preliminary commendation, Dutch Seedling—Mrs. A. L. Hammond.

Collection of five (5)—'Apple Blossom' Lud. R. #422-D. 5A—Mrs. A. C. Pickard.

Sweepstakes Winner—Mrs. A. C. Pickard.

An added feature was the impressive Amaryllis arrangements by members of the Amaryllis Society (Fig. 5). The focal point of interest was the display of the award plants and silver trophies awarded to the winners.

The visitors, both local and out of town expressed their pleasure for another educational presentation. The Amaryllis Handbook (Guide to Culture) written and published by Mrs. A. C. Pickard (founder of the organization) was much in demand as it was displayed in the Educational Section.

GREATER GULF AMARYLLIS SHOW, 1970

W. A. McCollum, *President, Amaryllis Society of Mobile,*
57 Hillsdale Lane, Mobile, Alabama 36608

The Greater Gulf Amaryllis Show was held on April 25 and 26. The entries totaled 217, and the Show was a decided success. Approximately 5,000 persons visited the Bel-Air Mall where the Show was held. The theme of the show was "Deep South Beauty".

SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW 1970

I. K. Rosoff, *Show Chairman,*
5617 Natick Avenue, Van Nuys, California

W. Quinn Buck, *Show Co-Chairman,*
26 E. Camino Real, Arcadia, California

The Sixth Official Amaryllis Show of the Southern California Hemerocallis and Amaryllis Society was held at the Los Angeles State and County Arboretum, 301 N. Baldwin Avenue, Arcadia, California, on Saturday and Sunday, April 25, and April 26, 1970, entitled "A Carnival of Color", the theme of the show. To emphasize the theme, Joe Werling designed and printed the show schedule cover in blue and orange on chartreuse colored paper. The show emphasis was "GARDEN GROWING OF AMARYLLIS" and the displays pointed up the fact that these spectacular plants exist in various colors, sizes and shapes.

In the spring the most common ones seen are the *Amaryllis johnsonii* variants, with only a few white bi-colors on display. Oddly, the gardeners growing large displays of various Amaryllis in their yard gardens are for the most part born in Europe and emigrated to this country in their mature years. They are acquainted with the greenhouse grown flowers and are trying to raise the European bulbs in their outdoor gardens, but with not too much success. After seeing the displays of the various hybridizers (Plant Life, 1969, page 29), their interest was renewed and they are in the market for the local bulbs. To these gardeners the fall amaryllid, the pink colored *Brunsvigia,* is still thought to be a lily! More amaryllid public relations are needed.

This year we had a few weeks of unusual warm weather a month or so prior to the show, and then it turned cool, forcing the greenhouse potted bulbs to mature earlier. Most of the exhibits were garden grown with enough greenhouse or sheltered potted plants to make a fine competitive exhibition.

THE AWARDS AND WINNERS ARE AS FOLLOWS: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy,—S. S. Harshbarger; SWEEPSTAKES RUNNERUP—So. Calif. H & A Soc. Trophy,—Leonard Doran; BEST REGISTERED LUDWIG VARIETY—Ludwig Challenge Cup,—Tom Humphreys, La Jolla, with 'Goliath'; BEST REGISTERED LARGE FLOWERED HYBRID (other than Ludwig) —So. Calif. H & A Trophy,—S. S. Harshbarger, with 'Hellas'; BEST MINIATURE—Mrs. Gladys Williams Award,—I. K. Rosoff; BEST MINIATURE RUNNERUP—So. Calif. H & A Soc. Award,—I. K. Rosoff; BEST SEEDLING—Show Chairman's Award,—S. S. Harshbarger, a white with ruffled petals; BEST SEEDLING RUNNERUP—So. Calif. H & A Soc. Award,—W. Quinn Buck, #50 Seedling (an unusual mauve pink color); BEST FLOWER IN SHOW—Judges Award, —W. Quinn Buck, Seedling; POPULARITY POLL WINNER—President's Award,—Tom Humphreys, La Jolla, with 'Goliath'; AMERICAN AMARYLLIS SOC. AWARD OF MERIT—S. S. Harshbarger, with 'Hellas'; and Dr. Kelly Spearman, with 'Brilliant Star'.

AMERICAN AMARYLLIS SOC. PRELIMINARY COMMENDATION: W. Quinn Buck—#50 Seedling; Ed Pencall—Rose Seedling; and S. S. Harshbarger—White Seedling.

SPECIAL AWARD: A Rosette to Mrs. Gladys Williams—a new species, rare and beautiful, *Amaryllis papilio* (See 1970 Plant Life, page 83, Fig. 21). Compare with Mrs. Williams' entry.

SPECIAL AWARD: A Rosette to Mr. Leonard Doran—*Amaryllis pardina* Hybrid—a double raised from his own seed, beautiful spotted and yet different.

AWARDS TO: Mr. Bruce Claflin of Upland; Mr. E. A. Angell of Loma Linda; Mrs. Marie Turner of Temple City; and The Chadwicks of Redondo Beach, all growers and hybridizers of Amaryllis, who supplied the show with hundreds of blooms that made the exhibit hall a mass of color and beauty.

Letters of appreciation to Mr. G. Keep of Sepulveda, a commercial grower of Amaryllis, and J. S. Vosberg of Sunland, a grower and sales-

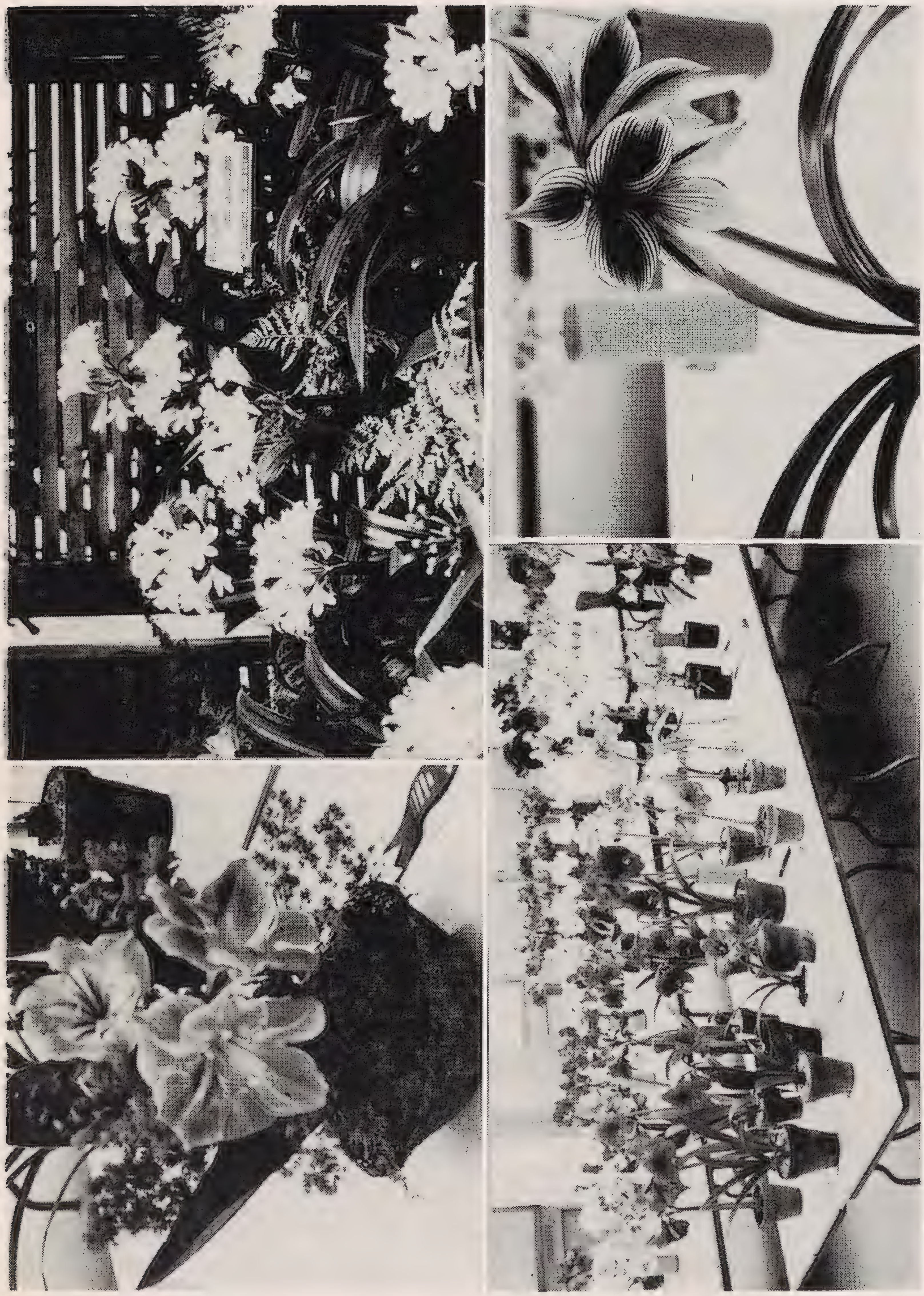

Fig. 6. Exhibits at the Southern California Official Amaryllis Show, 1970. **Upper left**, Floral arrangement; **upper right**, exhibit of yellow Clivias; **lower left**, part of exhibit of potted hybrid Amaryllis; and **lower right**, exhibit of **Amaryllis papilio.**

man of plants and bulbs for many years.

A SPECIAL AWARD: A Rosette for the exhibit, and a plaque for the research being made to find better methods of clonal increases, to associates Roger Boddaert, Irving Cantor and Robert Epstein, on a group of outstanding yellow *Clivia* cultivars: *C. citrina* and *C. kewenses,* an English hybrid. Clivias in the southland are quite common, but all are of a pale orange yellow to reddish orange. This exhibit was a show stopper (See Fig. 6).

In the past, our floral arrangements were made and exhibited by florists. This year our members' wives were asked to try their skill in this art. No individual awards were to be given, and no name cards shown. Only home grown flowers and Amaryllis were to be used, and all receptacles individually improvised, such as coffee cans, jars, bowls, boxes, etc. The results were so unusual even the men stopped to look and admire. See Fig. 6. Mrs. Gladys Williams, Marie Creach, Ruth Fesmire, Dorothy Rose and Marian Harshbarger entered one or more exhibits. A special award ribbon was given, but no one knows what happened to the award when the show closed.

In the 1969 show Ed Pencall exhibited his flowering seedlings in large containers and made an eye-catching exhibit. This year his exhibit was a wooden box almost 3 feet in all dimensions, containing 25 scapes having 69 blooms of white seedlings. This exhibit was placed just inside the hall, and more pictures were taken of this exhibit than any other in the show. A Rosette was given for this outstanding specimen.

Again, Amaryllids were shown with more members bringing in their specimens. Mr. F. T. Ching, Director of the Arboretum, contributed a number of *Crinum* Species that were in bloom; Mrs. C. H. Welborn, *Crinum* 'Ellen Bousanquet'; J. S. Vosberg, *C. 'powelli album';* I. K. Rosoff, *C. kirkii* and 'Cecil Houdyshel'; Joe Werling, *Sprekelia;* Marie Creach, *Cyrtanthus;* and a large collection of *Haemanthus,* none however, in bloom. Mr. W. H. Gilliam of Oxnard, a large pot of *H. katherinae;* and I. K. Rosoff, ten species, no two having the same leaf formation. No awards given.

A card gave the date, time and place of our Fall meeting that is devoted to Amaryllids in blossom then, re-blooming *Amaryllis, Lycoris, Nerines, Crinum, Haemanthus, Brunsvigia, Vallota purpurea,* and various *Zephyranthes.*

The Arboretum turnstile count Saturday and Sunday was 11,000. Of this number, 3000 visited our show and cast over 800 votes for the best flower in the show. Only a few votes separated the four top runners, and they were (listed alphabetically) as follows:

Mr. Doran's Pardina Hybrid; Mr. Harshbarger's white seedling; Mr. Humphrey's 'Goliath'; and Mrs. Williams' *Amaryllis papilio* (a large, a medium and two small blooms).

Saturday's count showed *Amaryllis papilio* ahead by 39 votes, and the second choice also a small one (See Fig. 6). Sunday's votes changed everything. 'Goliath' first, followed by the next larger bloom. The number of votes separating top and bottom was 51. People still like large blooms.

The certified judges were: Mrs. Kenneth Anderson, Mrs. Eva Turnquist, Mrs. Gladys Williams, Mr. Quinn Buck, Mr. Roger Fesmire, and Mr. Jack McCaskill. Clerks, Charles Hardman and Joe Werling.

Credits are due to Jack McCaskill, Photographer; Joe Werling, Printing, Show Cards and Signs, and V. Romito, Photo Engraving Negatives and Prints.

HATTIESBURG OFFICIAL AMARYLLIS SHOW 1970

Mrs. Sam Forbert, *1910 Evergreen Lane,*
Hattiesburg, Miss. 39401

The Hattiesburg Amaryllis Society held its annual spring show at the Garden Center, May 9, 1970. The theme of the show was "Around the World with Flowers". Much interest was shown in both the horticulture and artistic design divisions.

Sweepstakes award, a silver tray, donated by the Amaryllis Society, Inc. of Alabama, was won by Mrs. Ruth Bethea. An award of merit, a silver tray donated by Mrs. R. A. Fowler, was won by Mrs. O. F. Coursey of Moss, Miss., for the clone 'Apple Blossom.'

Other winners were Mrs. H. W. McGee and Mrs. Johnnie Jackson, who won silver trays donated by Kling Florist and Fisher Florist, for the best in the cut Reginae type and Leopoldii type Amaryllis. Mrs. Ruth Bethea won the silver award donated by the Hattiesburg Amaryllis Society.

In the art Exhibit, Mrs. Debbie Bright won the Davis and Parker Paint Store award. Tri-color, silver tray, donated by Southland Florist for best design in a designated class was won by Mrs. J. O. Mayo for "Changing of the Guard." Mrs. U. J. Lucas won the creativity award for a design titled, "Paris Sidewalk Cafe."

The horticulture judges, all from Mobile, Alabama, were Wilmer H. Smith, Mr. and Mrs. Jeff A. Brown, Mr. and Mrs. Dewey Hardy, and Mrs. A. B. Palmer. Artistic design judges were from Laurel, Miss.—Mesdames John E. May, Virgil Kirkland, and Otto M. Wansley, Sr. Prior to judging, the judges were entertained in the home of Mrs. D. R. Cole and later the judges were guests at a luncheon at a local restaurant.

THE AMERICAN AMARYLLIS SOCIETY STUDY COURSE FOR THE AMARYLLIS JUDGE'S CERTIFICATE

Mrs. A. C. Pickard

Amaryllidaceae (Am-ah-ril-i-day see-ee), the Amaryllis family, is a large group of widely distributed perennial herbs growing from bulbs, or rhizomes.

An Amaryllis is a member of one genus usually bearing from two to several lily like florets on a single leafless scape. The blossoms are of various sizes, from miniatures to giant sized blossoms. The varying forms of the flower ranging from the long trumpet, like the Easter Lily, to the open faced Dutch hybrids. There are double forms and irregular orchid shapes. The colors range from pure white, pink, red, scarlet, salmon, pastel tints, blends and stripes.

The word "Amaryllis" is the classical name given the plant by Linnaeus, the great Swedish botanist. The word is derived from the Greek word "Amarysso", meaning "to sparkle" and refers to the surface texture of the blossom.

The name, "Belladonna", is the Italian for "beautiful lady". The master plant recorder and botanist Linnaeus finally adopted the name Belladonna in combination with his new generic name, Amaryllis. For more than 250 years various forms of Amaryllis Belladonna have been in cultivation and crossed with other species and this has opened up a great field for the plantsman. The common form of *Amaryllis belladonna* is grown in Florida, known as Florida red, is botanically referred to as *A. belladonna* var. *major.*

The American Amaryllis Society has classified *cultivated* Amaryllis in nine Divisions on the basis of the chief characteristics of each group. Further sub-divisions may be made within each of the nine divisions. Each division contains many varieties. This form of classification is necessary, as the foundation for exhibition schedules and as the basis for Amaryllis breeders. Familiarity with the flower and its parts is necessary to intelligent evaluation.

In order to simplify the classification, the nine divisions of cultivated Amaryllis have been arranged in numerical order with a brief description of the distinguishing characters of each.

Division 1. (D-1) Includes all the cultivated wild Amaryllis species, sub-species, varieties and forms. The majority of species are native to Bolivia, Brazil and Peru. Example: *A. striata* var. *fulgida.*

Division 2. Long-Trumpet (D-2). The whole flower is very long and trumpet shaped, similar to the Easter Lily. The pedicels are relatively long and the flowers are distinctly drooping. The tepaltube is very long, 4½ to 5½ inches. Example: *A. elegans* var. *ambigua,* —color of flowers white striped with pink lines.

Division 3. Belladonna type hybrids. (D-3) The flowers are much shorter than in Division 2 and gracefully drooping. The pedicels are long and the tepaltube less than 4 inches in length. They show the influence of species with the informal flower structure of *Amaryllis belladonna, Amaryllis vittata* and others. Example: (a) *A. johnsonii* (b) 'Christmas Joy'.

Division 4. Reginae type hybrids (D-4). The pedicels are shorter than in Division 2 and 3. The tepaltube less than 2 inches in length. The flowers are slightly drooping, horizontal or slightly upright and are moderately open faced. When viewed sideways, the flower length exceeds 4 inches. The tips are rounded or slightly pointed. There are two sub-divisions in Reginae. D-4A—markedly imbricated type. The tepalsegs overlap ¾ or more of their length. Tips of segs are rounded or slightly pointed. Example: 'Friendship'. (V.M) D-4B.—This is the less imbricated type. The tepalsegs overlap less than ¾ of their length. The segs are sometimes reflexed. The tips are rounded or pointed. Example: 'Picotee' (Ludwig).

Division 5. Leopoldii type hybrids (D-5). The flowers are similar to those of Division 4 except the flowers are wide open flat form. When viewed sideways, the length must not exceed 4 inches. There are two sub-divisions in this division. D-5A.—The tepalsegs are imbricated almost their entire length. The tips are rounded. Example: 'Boquet' (Ludwig) D-5B.—The flowers are similar to D-5A except the segs are less imbricated. The tips are rounded or slightly pointed. Example: 'La Forest Morton' (Ludwig).

Division 6. Orchid flowering type. (D-6) The tepalsegs are not arranged according to the usual flower pattern. They are variously shaped, twisted or extremely reflexed, similar to *Sprekelia* (the Aztec Lily). Example: 'Cannae Butterfly.'

Division 7. Double hybrids (D-7). This division includes the semi-double and fully double forms of hybrids under culture. The flowers have two, three or more rows of segs, each seg narrowing and shortening toward the center of the flowers. There may be petaloid ''ears'' in the center. Example: 'Helen Hull.'

Division 8. Miniature type hybrids (D-8). Distinctly dwarf statured types, including various flower forms. The flowers harmonize with the smaller scape diameter and height. Example: Gracillis hybrids; ('Fire-Fly').

Division 9. Unclassified hybrids. (D-9) Meritorious hybrids that cannot be placed with certainty into any preceding Division.

The flower form and structure make up the chief difference between Reginae hybrid (D-4) and Leopoldii hybrid (D-5). The Reginae flower moderately open faced but not flat. The Leopoldii flower is a wide open flat form.

Familiarity with the Divisions of cultivated Amaryllis is necessary to intelligent evaluation.

A mature plant produces inflorescences and fruit.

A *clone* is the original and offspring reproduced by asexual methods (vegetative method of reproduction). An *unnamed seedling* refers to the seedling grown from a particular seed before there is any increase by vegetative means. *Unnamed clone* refers to the unnamed seedling plus any of its increase by vegetative means. After the unnamed clone receives a name and is registered, it is referred to as a *named clone,* such as 'Apple Blossom', 'Boquet', etc.

Besides the essential reproductive organs, there are several accessory parts:

Inflorescence is the flower bearing stem or stalk consisting of the scape, spathe valves, pedicels and the blossoms. It is the flower cluster.

A *scape* is a leafless stem that rises from the bulb (without foliage) which supports the bloom.

An *umbel* is a flower cluster of two or more flowers that rises from the same point on top of the scape.

A *pedicel* is a stem of one flower in a cluster. (The support or arm of the flower.)

Spathe-valves are leaf like bracts enveloping the immature flower buds and protect them from injury before they open.

Tepalsegs are the six parted portions of the blossom. The three posterior tepalsegs are setepalsegs (abbreviated to setsegs). These are usually broader than the three inner tepalsegs.

Petepalsegs are the anterior tepalsegs and are called petsegs for short.

Note.—Observe the difference in size of the tepalsegs as they make up the characteristic form of the flower.

Tepaloids are characteristic of some Amaryllis hybrids. Sometimes the tepalsegs are variously lobed or twisted near the center. They vary in width, shape and length. They are sometimes referred to as ''ears''.

Nectaries are glands for the production of nectar and fragrance, attracting insects and birds that transfer the pollen from the anthers to the stigma of the blossom.

The flower organs of reproduction are formed partly inside the perigone. The *stamens* are the male reproductive organs. These are composed of very small stems called *filaments,* which are topped by two lobed *anthers.* When mature, the lobes split lengthwise and expose the *pollen* grains necessary for pollination of the blossom.

The *pistil* is the female reproductive organ. It consists of the *ovary, style* and *stigma.* The stigma is the capitate or three-lobed structure that receives the pollen.

An Amaryllis hybrid is a plant resulting from a cross between parents unlike one another in one or more heritable characteristics.

Conformity to Division standards is of first importance in the placement of entries in Amaryllis shows. Amaryllis can be judged for flower structure and flowering habit by Division standards only.

Group entries in various colors, shapes and sizes make the show more interesting. There may be a collection, minimum of 5 scapes all same variety; or 5 different types; or mixed colors.

Specialization is excellent for Flower Shows. Some think it is more spectacular and more exotic to feature Amaryllis only at an Amaryllis Show, while other Shows sometimes show the *Clivia, Crinum, Eucharis, Nerine, Narcissus,* etc. These other Amaryllids may be included to give variety and information about the 85 genera and 1000 species in the large *Amaryllidaceae* family. To the general public, these just named are other kinds of flowers, because in shape, size, etc. there is no resemblance to *Amaryllis.* With the exception of *Narcissus,* no detailed classification of the flower types of the other Amaryllids is available.

Anthers may be removed without penalty (if permission is granted by the show committee) in order to prevent pollen dusting over the segs, or for other prevailing reasons.

Amaryllis scapes grow tall and it is often necessary to stake them. If the stakes or ties are not conspicuous then no deduction in points is made.

		Possible score		
Character scored:	**Method of Rating**	**single specimen**	**single scape**	**potted plants 2 or more scapes**
1. Perfection of flower shape	Rating is to be strictly within the division standard on the basis of beauty of form	15	15	15
2. Conformity to flower color standard	No flower of inferior color is to be considered. Whenever possible rating is to be on the basis of a verifiable color standard (chart) in order to avoid errors due to difference in individual color perception	45	45	35
3. Flower size	Since flower size is dependent on the flower division, the sizes recognized in the particular division concerned should govern	15	15	15
4. Length and character of scape	The length of the scape should be considered in relation to the size of the florets	5	5	5
5. Number of florets per scape and number of expanded flowers (number of florets per scape includes unexpanded and expanded flowers)	Only 3 or more flowers per scape are eligible. For two **expanded** flowers per scape, allow 3 points; for 3 allow 5; for four or more, allow 6 points. In miniature 2 or more flowered scapes are eligible; allow 4 points for two expanded flowers, 6 points for three or more	6	6	6
6. Number of scapes per plant	This category applies only to potted plant exhibits. Allow 8 points for one scape; 9 points for two scapes; 10 points for three or more scapes	—	—	10
7. Fragrance	Allow 2 points for fragrance, not too faint or too strong; deduct 2 points if fragrance is lacking	2	2	2
8. Foliage *	This category applies only to potted plant exhibits; for foliage absence deduct 2 points; for foliage not much developed, allow 1 point; for well developed foliage allow 2 points	—	2	2
9. Condition of exhibit	Exhibits in prime condition are to receive the full allowable points; those failing to come up to standard are to be penalized accordingly	12	10	10
	Total possible score	100	100	100

* Leaf growth that comes along with the flower scape is very desirable but some varieties do not produce foliage until the flowers have appeared. Leaf growth is quite frequently the result of temperature control. The foliage usually appears before the blossom scapes in yard grown **Amaryllis.**

OFFICIAL AMERICAN AMARYLLIS SOCIETY SHOW RULES

The official awards of the American Amaryllis Society may be presented at any Amaryllis Show or Amaryllis division of a general flower show which complies with the rules of the Society.

(1) All flowers exhibited are to be expanded in half or more direct light to show the typical flower color of the florets. Judging in all

cases is on the basis of open blossoms and number of blossoms per scape. *Never* on the basis of the total number of blossoms of the potted plant.

(2) All exhibits must have been grown by the exhibitor. All plants in his possession less than one year should be classified and judged separately. All greenhouse grown plants should be classified and judged separately from yard grown plants.

(3) The Award of Merit is offered to the named and registered exhibit rating 95 or more. Second and third prizes may be offered in each division.

(4) In order to have only flowers in their prime condition, it is permissible to remove any scapes with fading flowers.

(5) It is very important to designate some one to write a *very brief* review of the official show, and to send this promptly to Dr. Hamilton P. Traub, Editor, Amaryllis Year Book, 2678 Prestwick Court, La Jolla, Calif. 92037. Your plans are not complete until this appointment is made. Only in this way is a permanent international record of the show assured.

In listing *named* clones, it is important to inclose the names in single quotation marks, thus: 'La Forest Morton', 'Maria Goretti', etc. Do not underline, or put in all capitals.

The Amaryllis Judges Training Course concerns the Amaryllis plant, the wild and cultivated Amaryllis, the Divisions of cultivated Amaryllis, and the judging of Amaryllis specimens and potted plants at Amaryllis Shows.

The Amaryllis Judges Certificate indicates the applicant is qualified to judge in the Horticulture division of Amaryllis, as of the date issued.

AMARYLLIS JUDGES' CERTIFICATES

Since the last report in the 1969 Amaryllis Year Book (page 32), the following numbered Amaryllis Judge's Certificates have been issued by the American Amaryllis Society:

No. 179. Mrs. James Edward Hamner, III, 2922 Mayfair Drive, San Antonio, Texas 78217. Horticulture only.

No. 180. Mrs. R. D. Bragg (Jewell), 1627 Mardell, San Antonio, Texas 78201. Horticulture only.

No. 181. Mrs. Henry W. Gomez, 2907 Chisholm Dr., San Antonio, Texas 78217. Horticulture only.

No. 182. Mrs. Kathleen Hart Wyner, 311 W. Hollywood, San Antonio, Texas 78212. Horticulture only.

No. 183. Mrs. Gilbert H. Yarbrough, 442 E. Gerald Av., San Antonio, Texas 78214. Horticulture only.

No. 184. Mrs. G. Browning Smith, Rt. 3, Harlingen, Texas 78550. Horticulture only.

No. 185. Mrs. Paul J. Opper, 237 E. Summit, San Antonio, Texas 78212. Horticulture only.

No. 186. Mrs. Harley E. Crouch, Box 1408, San Antonio, Texas 78586. Horticulture only.

No. 187. Mrs. Robert B. Arnold, P. O. Box 245, Ingleside, Texas 78362. Horticulture only.

No. 188. Mrs. D. A. Ingalls, 515 Nardac Place, San Antonio, Texas 78218. Horticulture only.

No. 189. Mrs. David P. Martin, 105 Cas Hills, San Antonio, Texas 78213. Horticulture only.

No. 190. Mrs. Emma Mae Allen, 210 Alpine St., Chickasaw, Ala. 36611. Horticulture only.

No. 191. Mr. W. A. McCollum, 57 Hillside Lane, Mobile, Ala. 36608. Horticulture only.

No. 192. Miss Mildred Laughlim, 701 Dauphin Island Parkway, Mobile, Ala. 36606. Horticulture only.

No. 193. Mr. John R. Clark, 4456 Bush Lane, Mobile, Ala. 36619. Horticulture only.

No. 194. Mrs. Mittie Young, 303 Hillside Drive, Chickasaw, Ala. 36611. Horticulture only.

No. 195. Mrs. Wm. P. Cazalas, 160 Randolph St., Mobile, Ala. 36609. Horticulture only.

KEEPING UP WITH LATEST DEVELOPMENTS.—Current progress in the judging of Amaryllis is recorded in the Amaryllis Year Book. In order to insure that those holding Amaryllis Judge's Certificates keep up with these new developments, all certificates issued are valid only when presented with the current membership card of the American Plant Life Society which includes membership in the affiliated American Amaryllis Society. After several years a refresher course is recommended.

TRAUB—NEW AMARYLLIS SPECIES—continued from page 47.

cm. wide, acute-apiculate; 2 side setsegs elliptic, 6.4 cm. long, 2.9 cm. wide, acute-apiculate; 2 side petsegs elliptic, 6.6 cm. long, 2.5 cm. wide, bluntly sub-apiculate; bottom petseg, linear, 6.2 cm. long, 1.3 cm. wide, bluntly sub-apiculate. *Stamens* fascisculate-declinate-markedly ascending; anthers at anthesis 5 mm. long, pollen yellow. *Style* declinate, markedly recurved; stigma capitate, obscurely 3-lobed. *Capsule* very deeply lobed, lobes extending downward markedly; seeds D-shaped, flat, black, winged.

Range.—Known only from the nomenifer locality, midway between Corioco and Caranavari, La Paz Province, Bolivia.

Notes.—The flowers were long lasting, over two weeks; two flowers opened at a time in succession. One very small bulb produced a 1-flowered scape, but the flowers were almost as large as in the 4-flowered scape.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

COLLECTING TRIPS INTO CHILE, 1968 & 1969

Carlos Gomez Ruppel

In the following commentary I shall refer to two trips, both of them undertaken between September 20 and October 15 though without fixing any further dates but stating only the localities visited.

The trip from Mendoza to Santiago lasts 45 minutes by air, whereas it takes 13 hours to do the same by train. In spite of the discomfort, I had always gone there by train as from the windows of the railroad car I could better contemplate the vegetation, thus getting a better idea of the plants I might find later on when carrying out my excursions to those places which appeared to be interesting.

My goal was Quilpué City, only a few kilometers from Valparaiso, Chile, where I made friends with Professor Otto Zöllner, a courteous botanist to whom I am indebted for determining some of the species collected.

In a gently sloping ''campo'' (i.e. a very large field) right at the south of this progressive city, I found—notwithstanding a terrible drought affecting nearly all the country—several bulbous or rhizomatous plants in full anthesis: *Calydorea speciosa* Herb., *Iridaceae* with white flowers, 5 centimeters in diameter, with dark spots in their middle; white flowered *Leucocoryne*, some of which have an agreeable smell and are, therefore, ''harvested'' in baskets and sold in the flower markets, mostly in Santiago, Chile; two small plants rather like *Rhodophiala*, due to their bulbs and leaves; two blue flowered *Liliaceae*, very ornamental and long lasting after cutting: *Pasithea coerulea* (R. et P.) D. Don (see color plate in ''Flores Silvestres de Chile'' by C. Muñoz Pizarro, page 146) and a *Conathera* sp., possibly *biflora*, flowering quite well in pots and easily cultivated; Two *Lobelia* spp. and a white *Oenothera*, *Lavausia mitica*, and so on.

I recommend visiting this easily reached ''campo'' (which is so near Quilpué) during the normal rainy season, towards the end of September for it must then be a veritable paradise with its abundance of flowers.

AN EXCURSION TO QUINTEROS. Coastwards, to the east of Quilpué, Professor Zöllner and I arrived at Valparaiso. Thence northwards along a magnificent road, passing through Viña del Mar—a sumptuous seaside resort—and Concón until we got to the Quinteros zone. A few kilometers to the north of this city, among some pasture lands I observed a large bed of red flowers in the distance, which, on getting nearer, turned out to be *Phycella bicolor* (R. & P.) Herb., a magnificent species which so far I had only encountered in pictures and which I had been hunting anxiously. We herborized, took several snapshots and took up a few bulbs (Fig. 9).

This species grows in high, well-drained lands, therefore in rich, black soil, sand and gravel, receiving fitting rains during the months of July through September, and finally flowering around the end of the latter month. By November everything becomes dry till the following season. It flowers upright, with its long narrow leaves among the high grass which shade its roots keeping them cool, though the flowers themselves flourish in full sunlight.

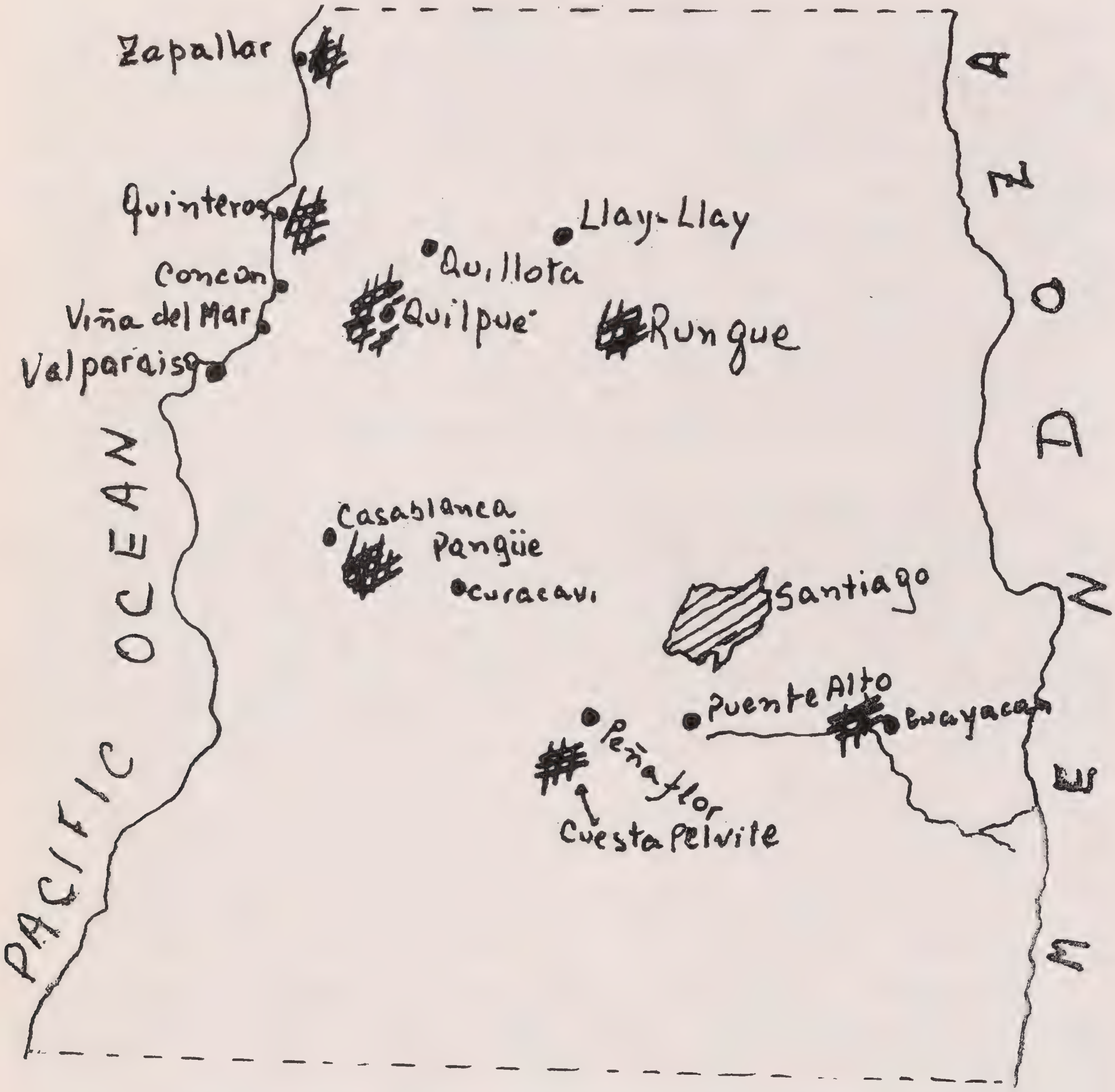

Fig. 7. Sketch showing Dr. Ruppel's collecting trips in Central Chile during 1968 and 1969. Cross-hatched lines indicate in general the places explored.

Later on, crossing the road to the left, towards the sea, we walked up to some sand dunes, about 500 meters away where a varied vegetation thrived. This consisted in *Puya chilensis* with its greenish yellow inflorescence; *Alstroemeria* spp. with thin leaves and long stems; *Rhodophiala* spp., ferns and *Nothoscordum* sp. in the shady places.

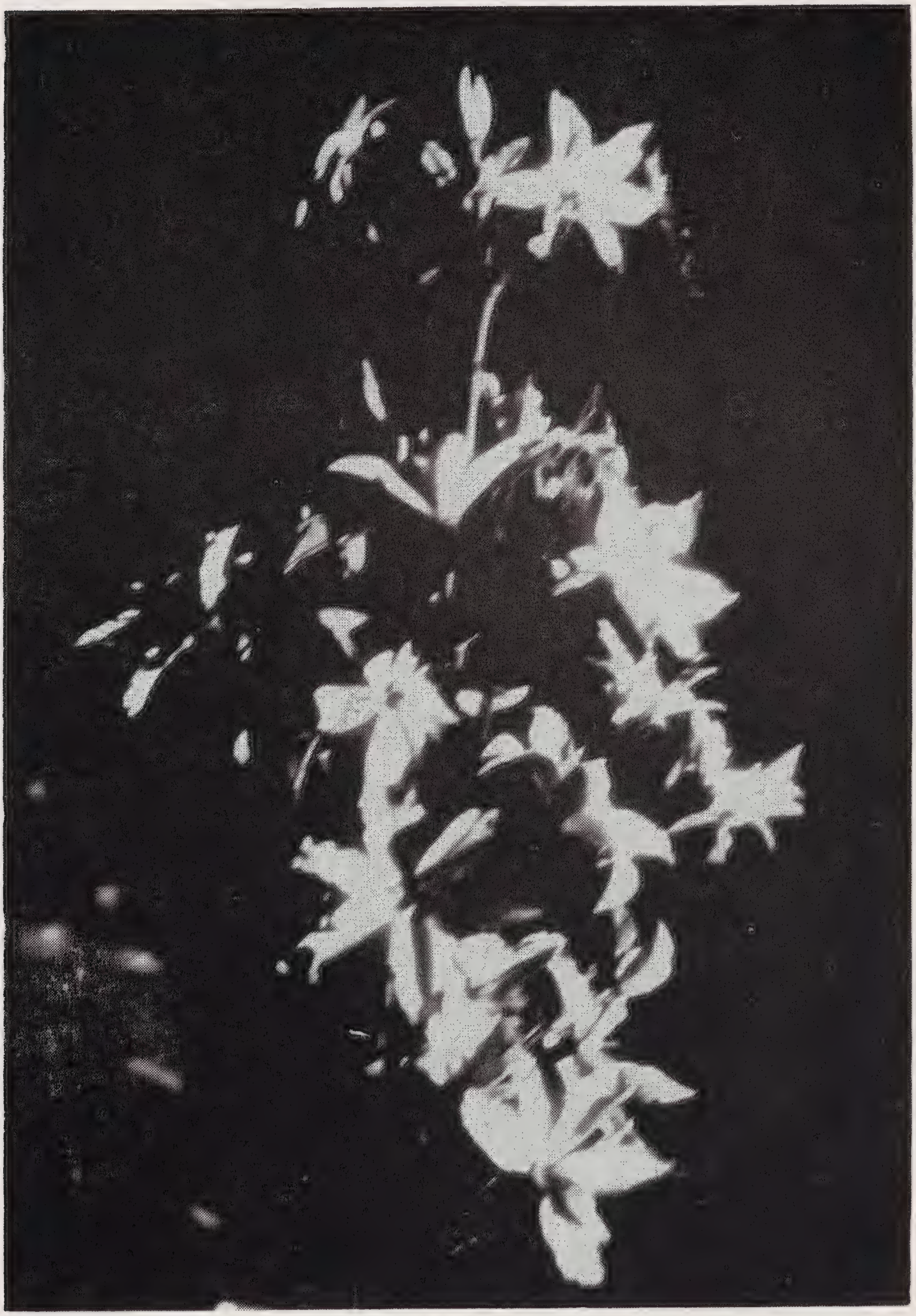

Fig. 8. **Leucocoryne violascens** R. A. Phil. Collected by Dr. Ruppel at Llay-Llay, near Quilpué, Chile.

EXCURSION TO PANGUE, in the province of Santiago, between Casa Blanca and Curacaví. A few hills rise up in this zone and, at the time, were barren due to the aforementioned drought. A stream runs at the base of the hills. At the edges of this stream there was a fair vegetation among which I found, after a slight search, an *Alstroemeria* sp. with bright leaves having pubescent edges, relatively large, which I shall call Alst. sp. No. 10 "Pangue". I then walked up to the hills and found *Tropaeolum tricolor* (See Muñoz Pizarro's book page 122), which, with climbing branches and bushes, make up a pageant of color and beauty. I have not seen it cultivated, so that I dare say this is not easy. But it certainly should be worth while trying to domesticate it.

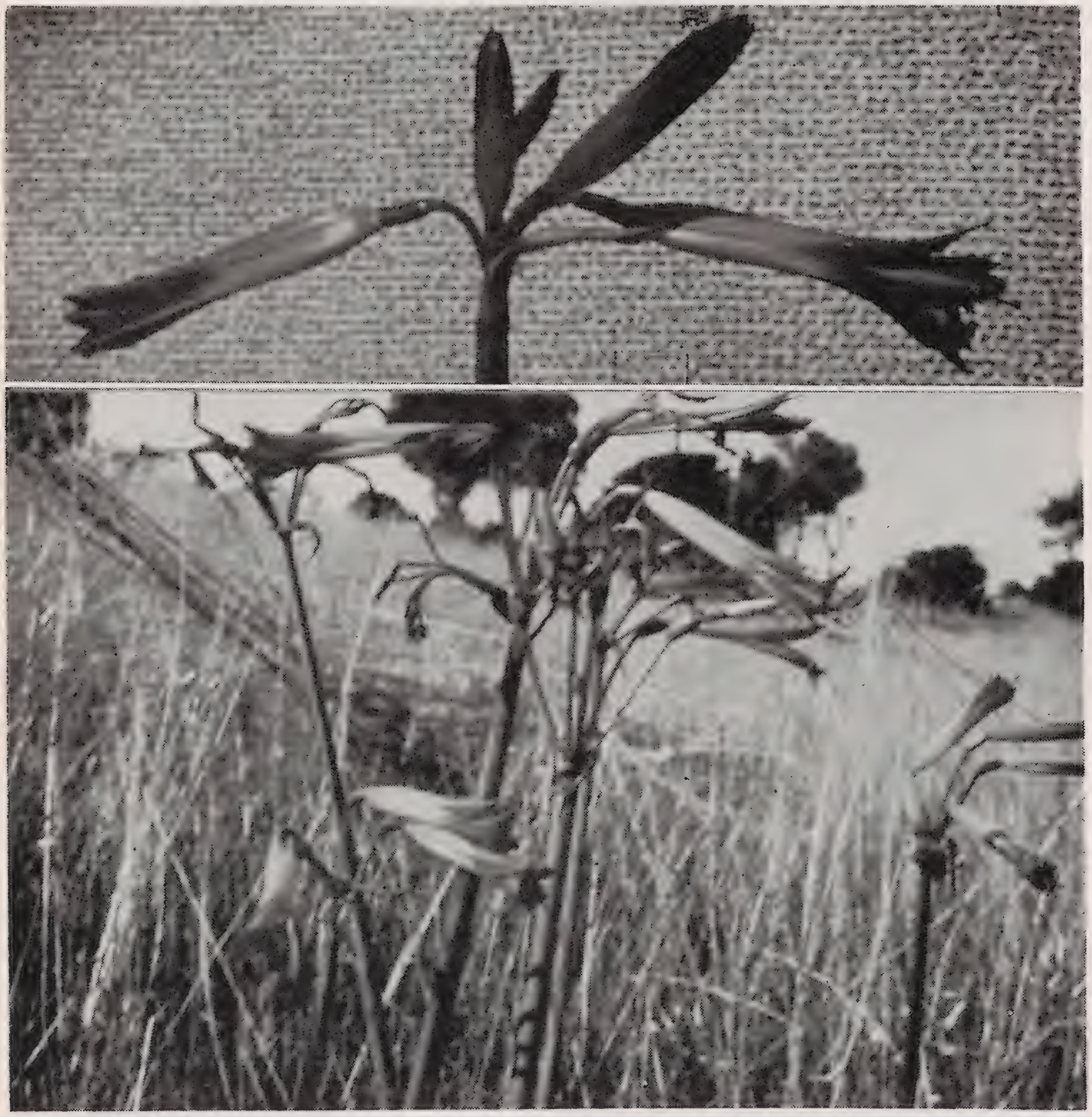

Fig. 9. **Phycella bicolor** (Ruiz. & Pav.) Herb. Collected by Dr. Ruppel at Quinteros, Chile. Photo by Dr. Ruppel.

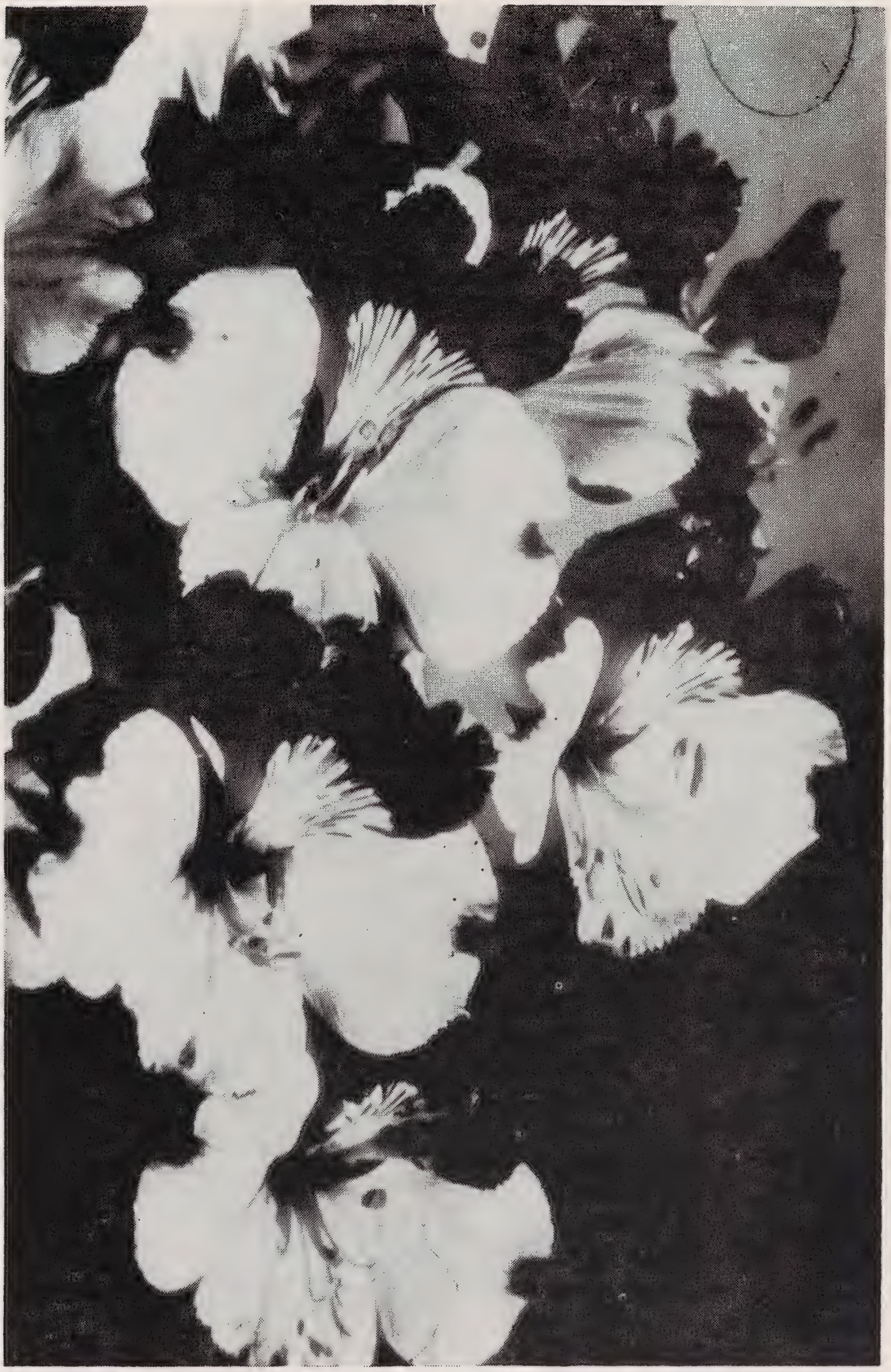

Fig. 10. **Alstroemeria** sp. collected by Dr. Ruppel at Zapallar, Chile. See map, Fig. 7. Flower scape enormous; flowers lilac-salmon. Photo by Dr. Ruppel.

EXCURSION TO CUESTA PELVIL. I left Quilpué and steered towards Santiago. It was painful to see the effects of the drought; wherever one looked one could see acre upon acre of dead cultivated plants, especially fruit trees and olive groves.

In spite of the poor prospects I planned a sally to the so called Cuesta Pelvil, a few kilometers to the south of Santiago, near a settlement called Peña Flor. There is a bus that takes one as far as Peña Flor, but to get to Cuesta Pelvil one has to hire a taxi-cab, and there are five kilometers to go. I hired one, whose driver, however, refused going uphill with the excuse that it would ruin his engine. So, from the foot of the hill I had to walk uphill a couple of kilometers, where—in spite of the drought—I began seeing plants that interested me: an *Alstroemeria* sp., of large wide leaves with scapes peeping out, some of them two centimeters wide. Possibly they were a species I had seen years before in bloom, and whose shaft was 1.50 meters high. Due to this I called it *A.* ''gigantea.'' I recall that its flowers were white, yellow spotted and about ten centimeters in diameter.

The plants were small and backward through lack of rainwater, but I found a dry shaft of the previous year in fairly good state, about eighty centimeters high with 7-forked branches (pedicels), each one with two remains of a receptacle. Therefore fourteen-flowered.

And then, wherever the eye could reach: *Alstroemeria decumbens* with their characteristic stems and narrow leaves, and another species which grows flat on the ground looking like a kind of lawn grass, which I shall call *Alst. cespitosa.* The latter is easy to pull up but not so the former, whose bulbous roots penetrated the soil (a rocky one) from twelve to sixteen inches. Finally, and in one sole group, several bulbs with leaves so characteristic of *Phycella bicolor* (R. & P.) Herb. (Syn.- *Phycella ignea* Lindl.) See color plate in Muñoz Pizarro's aforementioned book, page 82. See present Fig. 9.

This species turned out to be what I suspected, for it flowered in cultivation in 1969. All of these plants live at the foot of shady hillsides or in their semi-shade in black, rich, loose sandy soil among crumbled rocks, making it difficult, sometimes, to dig them up. The return trip to Peña Flor on foot took me about four hours, but being a downhill journey it was far less arduous.

EXCURSION TO CANON DEL RIO MAIPO (MAIPO River Canyon). The bus took me only as far as Puente Alto, situated about twenty kilometers to the south of Santiago. From there I travelled in another one which went along a fine road bordering the Maipo River upstream, and getting a lovely view of the nearby hillsides with their vegetation. One can choose any of the great number of places whose good prospects can be glimpsed from the bus and begin one's gathering after walking no more than 50 to 200 meters.

Alongside the road there are several settlements, but so tiny that they are not shown on the general maps. I got off the bus near Guayacan, which is one of these hamlets, and walked downhill part of the way, searching the hillsides.

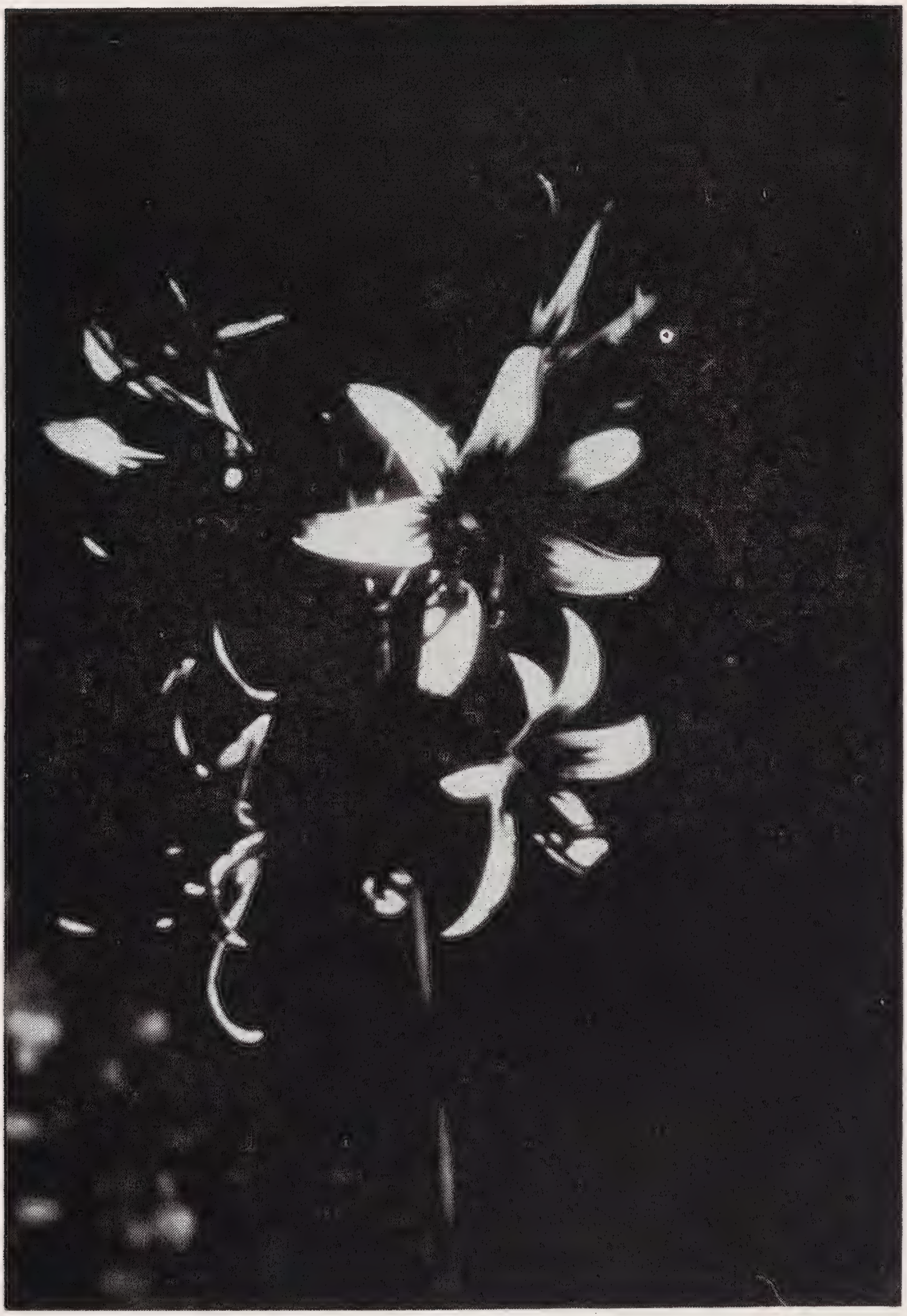

Fig. 11. **Placea arzae** R. A. Phil. Collected by Dr. Ruppel at Runque, Chile.

I soon saw an abundance of *Alstroemeria* spp.; one of the species I shall call Als. "Guayacan 1-68", which is, apparently late flowering as there was, at the time, nothing but foliate branches, with wider leaves but shorter than the species I shall speak of later on. They are fashioned into tighter rosettes and their scapes, dry since the previous year, were about seventy centimeters long.

Description of the dry scape of an Alstroemeria "Guayacan 1-68": Peduncles with an abundance of linear leaves twelve centimeters long and (?) centimeters in diameter; 70 centimeters high and 1.5 in diameter at its lower third.

Umbel: I counted 27 inflorescences measuring 25 centimeters diameter and 12 centimeters high. How beautiful it must have been "in flesh" and in full anthesis!

I insist that the data here given are approximate, as they were taken from material that had become dry and spoilt through exposure. Of this species I managed to get a few rhizomes in good condition.

Another *Alstroemeria* sp. found in a reduced area but with characteristics which differ from the former, I shall call: "Alst. Guayacan 2-68". It has narrower but longer leaves, with a less tight rosette and of a lighter green than the former, growing among shrubby thickets (underbrush). Therefore, the getting of any plant was quite unachievable. Dry shaft: 1.50 meters high, bearing straight pedicels.

In the sandy places of this area numerous Amaryllid spp. *(Rhodophiala* spp.?) also grew.

EXCURSION TO RUNQUE. This place is situated at the highest point of the road from Santiago to Quillota. *Rhodophiala* spp. and *Phycella bicolor* flower on its lower hills during September through October. The beautiful *Tropaeolum azureum* Miers (see color plate, page 124, M. Pizarro's book) with a beautiful fernlike foliage with deep spherical corms; and, finally, *Placea arzae* Phil. (Fig. 11) with conspicuous paraperigone, striped purple, yellow cream segments (see M. Pizarro's color plate, page 126).

I must own that notwithstanding the dreadful drought afflicting Chile, both my luck and enthusiasm helped me greatly.

Acknowledgement. The author of this paper is very grateful to Prof. Arthur Penny for his help in translating many passages.

BOLIVIAN AMARYLLIDS, 1970

MARTIN CARDENAS, *P. O. Box 538,*
Cochabamba, Bolivia

1. **Amaryllis nelsonii** Cardenas, **sp. nov.** (Fig. 12).

This showy *Amaryllis* reminds one at a glance of *A. yungacensis* Cárd. & Nelson, but differs by its green yellowish bright scarlet tipped tepals. This new species, is named after the late courageous botanical explorer and talented *Amaryllis* scholar, Prof. Ira S. Nelson, who in his 1958 trip to Bolivia, wanted anxiously to enter Caupolican Province previously explored botanically only by Mr. R. S. Williams of the New York Botanical Garden.

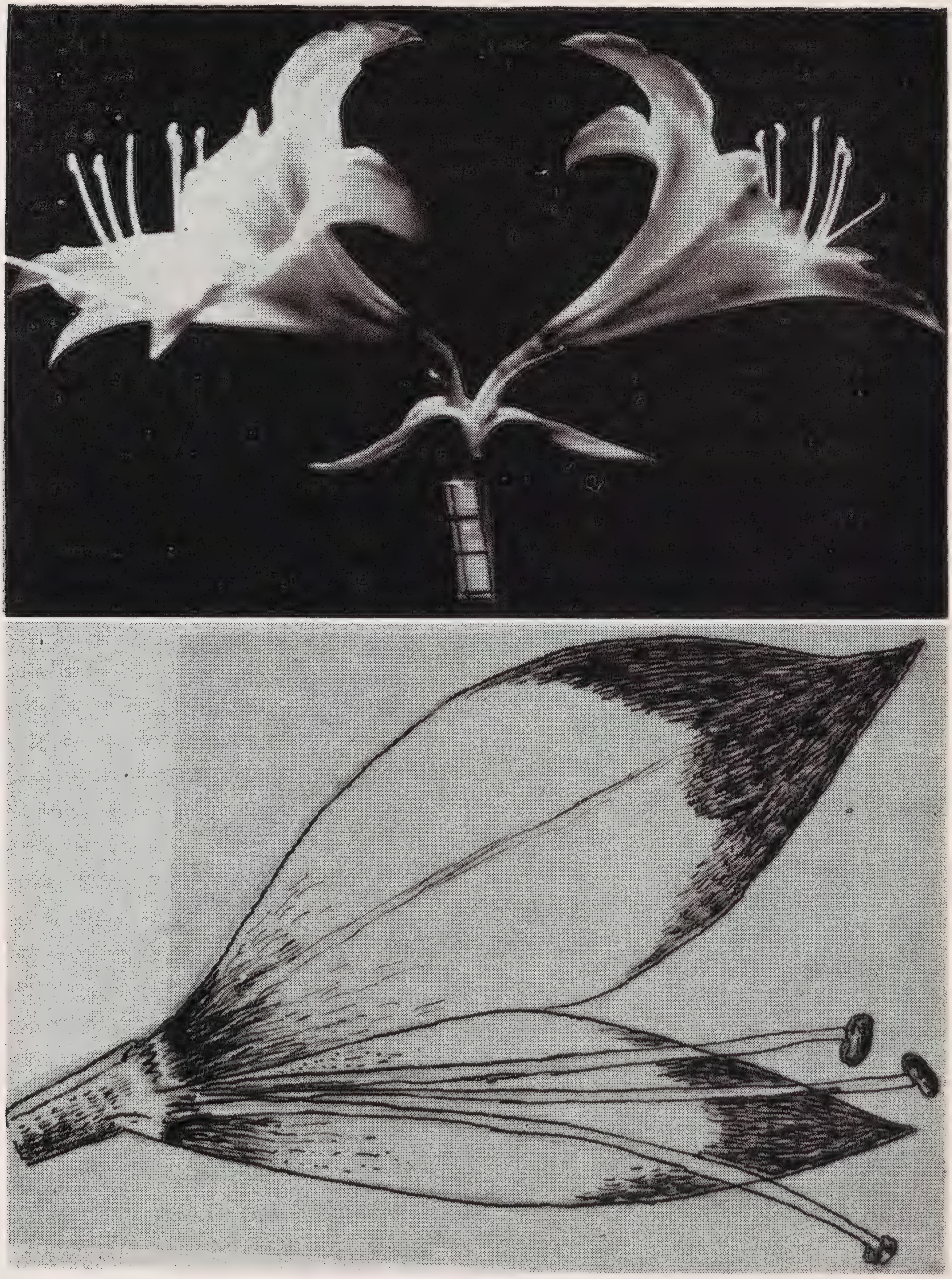

Fig. 12. **Amaryllis nelsonii** Cardenas. **Upper,** side view of umbel. **Lower,** partial long section of flower. Photo and drawing by Dr. Martin Cardenas.

Bulbo globoso, 5 cm long., 6 cm crasso. Pseudocollo 7 cm long., 3.5

cm crasso. Folis loratis 30 cm long., 3.5-4 cm latis. Scapo 20-25 cm long., 2 cm a basim crasso parce aplanatis, atro viride. Umbella 3 flora. Bracteis spathaceis lanceolatis 7 cm long. albidis, viride nervatis. Pedicellis 3 cm long. 7 mm crassis atro viridis. Floribus regularibus 12 cm long., 11 cm latis. Ovario 15 mm long. triquetrus atro viride. Tubo brevis 7-8 mm long. atro viride nitente. Setepalsegmentis late lanceolatis 10-11 cm long. 4 cm latis, extus diluto flavo viridiscentis a basim atro viridis nitentis, apice coccineus, intus a basim purpureo inspersus. Petepalsegmentis: lateralis 9 x 3.5 cm deflexis, inferioribus rectus 7 cm long, 2 cm latis, setepalsegmentis aequale coloribus. Paraperigonio temperato viridis, villosus. Staminibus 10-11 cm long. albidis. Stylo 9 cm long. non stamina superans, albidis, apice purpureis. Stigma capitata, trilobata, purpurea.

Patria: Bolivia, Provincia Caupolican, Departamento La Paz vicinis Fluvis Tumo, 750 m.

Bulb globose 5 cm long, 6 cm thick. Neck 7 cm long, 3.5 cm thick. Leaves lorate 30 cm long, 3.5-4 cm wide. Scape 20-25 cm long, 2 cm wide at base, somewhat flattened, dark green. Umbel 3 flowered. Spathe bracts lanceolate 7 cm long whitish, green nerved. Pedicels 3 cm long, 7 mm thick, dark green. Flowers regular 12 cm long, 11 cm wide. Ovary 15 mm long, dark green triquetous. Tube very short 7-8 mm long dark green shining. Setepalsegments lanceolate 10-11 cm long, 4 cm wide, whitish yellow greenish, dark green at base, scarlet red at the tips, purple flushed inside base. Petepalsegments: laterals deflexed 9 x 3 cm, lower straight 7 cm long 2 cm wide, all of the same colour as setepalsegments. Interior of the flower finely purple dotted. Paraperigone light green villous. Stamens 10-11 cm long, filaments white, anthers yellow. Style 9 cm long not longer than stamens, whitish, purplish above. Stigma capitate purplish, trilobate.

Bolivia, Province of Caupolican, Department of La Paz, Rio Tumo basin, 750 m. September 1969, E. Meneses, No. 6320, type in Herbarium Cardenasianum.

II. THE GENUS **PYROLIRION** IN BOLIVIA

Dr. H. P. Traub, in his The "Genera of Amaryllidaceae", The Amer. Plant Life Soc., 1963, gives a generic diagnosis and admits tentatively 10 species native to Perú and Bolivia. R. Foster in his "Catalogue of the Ferns and Flowering Plants of Bolivia," Gray Herb., 1958, includes for this country the two species: *Pyrolirion boliviense* (Baker) Sealy and *P. xiphopetalum* (Baker) Sealy. We have seen at the New York Botanical Garden Herbarium, the type specimen of *Zephyranthes xiphopetala* Baker, which reminded us of a very curious plant growing on the dry clayey slopes surrounding the City of La Paz. This plant attracts the attention of everyone by its solitary bright yellow flowers emerging from a slender scape which comes up from a whitish bulb not showing apparently any leaf at any time of the year. Baker's original description in Plants Collected in Bolivia by Miguel Bang, Henry H. Rusby, Memoirs, Torr. Bot. Club, 1895, does not give any description of the leaves, nor the fruits and seeds, since the type specimen does not bear such parts. According to the original diagnosis, the locality given by Bang was Vic. Cochabamba 1891 (No. 890). We do not know if in the recent years this taxon has been collected again and illustrated afterwards since La Paz, where it really occurs, was visited after Bang, by many botanists. Bang used to collect many specimens without labeling them at once. He ordinarily added the collection numbers and locality names later on. Thus, most of his locality references are too vague, confused or entirely wrong as in the case of this amaryllid.

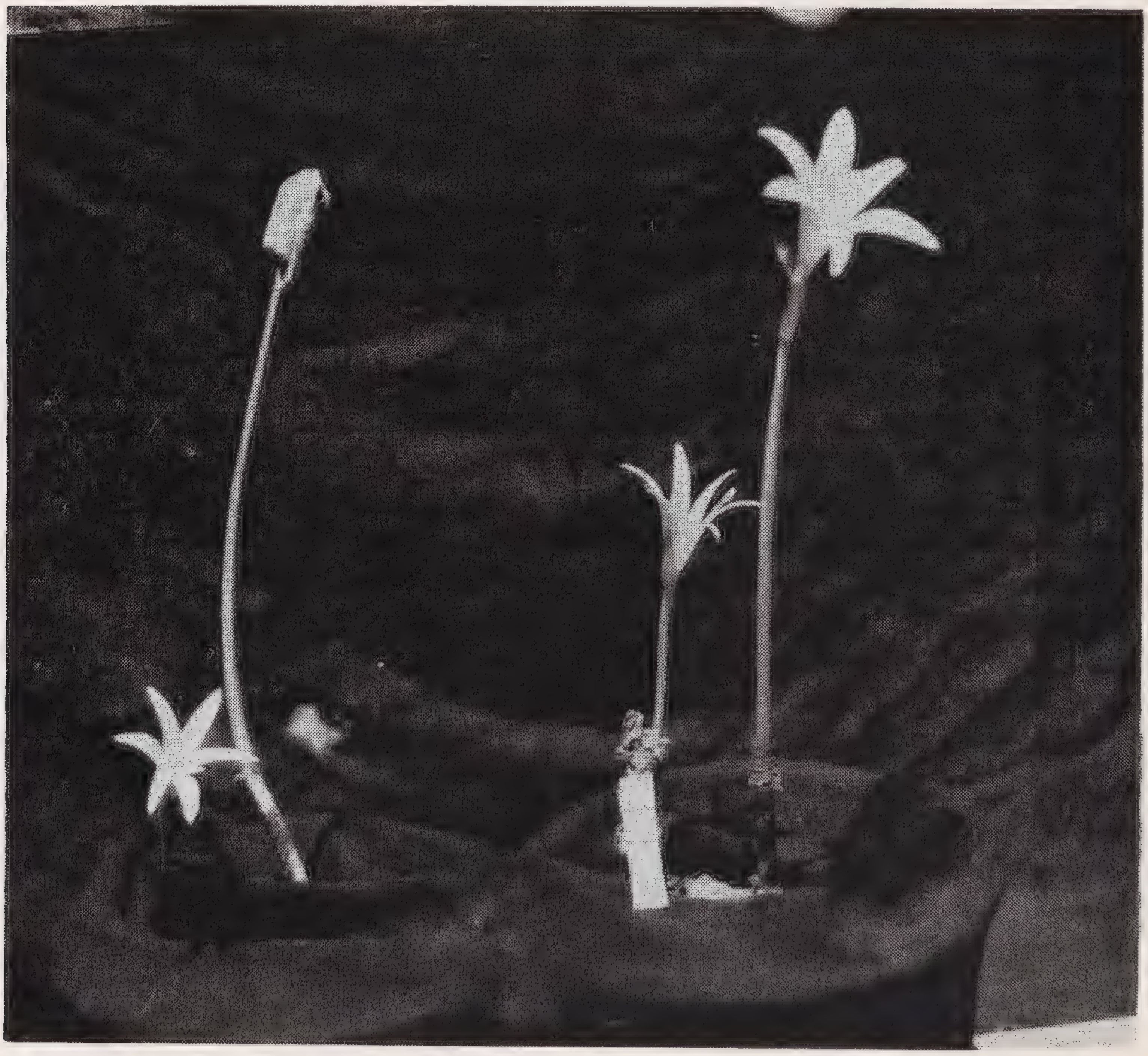

Fig. 13. **Pyrolirion xiphopetalum** (Baker) Sealy. Potted plants in flower at Cochabamba. Photo by Dr. Martin Cardenas.

Many years ago Dr. Belisario Diaz Romero, published in Boletin de Estadística y Estudios Geográficos, La Paz, the name *Balliviana uniflora* for the actual *Pyrolirion xiphopetalum* (Baker) Sealy. This name was naturally a nomen nudum.

Pyrolirion xiphopetalum (Bak.) Sealy (Figs. 13 & 14)

During the last year, we obtained several plants of *Pyriolirion xiphopetalum* and from them we draw the following description:

Bulbs whitish, tunicate 3-4 cm long. Scape solid, 10-20 cm long glaucous bearing only one sessile flower. Spathe bracts very light brown to whitish 2.5-4 cm long, acute. Flowers 5-7 cm long. Ovary obconic about 2 cm long, dark green shining. Tepaltube 4 mm long. Outer tepals 4-4.5 cm long, lanceolate 7 mm wide, bright yellow, greenish below, outside, bright yellow inside. Inner tepals lanceolate slightly narrower, bright yellow. Stamens adnate to the base of petals, 3 short and 3 longer. Filaments 9-12 mm long, light yellow. Anthers 4 mm long, deep yellow. Style 2 cm long, light yellow. Stigma trifid with expanded tipped lobes 1 cm long, yellow greenish. Fruit capsule about 1.5 cm long, 1.2 cm thick, trilocular. Seeds circular to luniform, black, about 7 mm long, slightly undulate at its surface and white membranous winged.

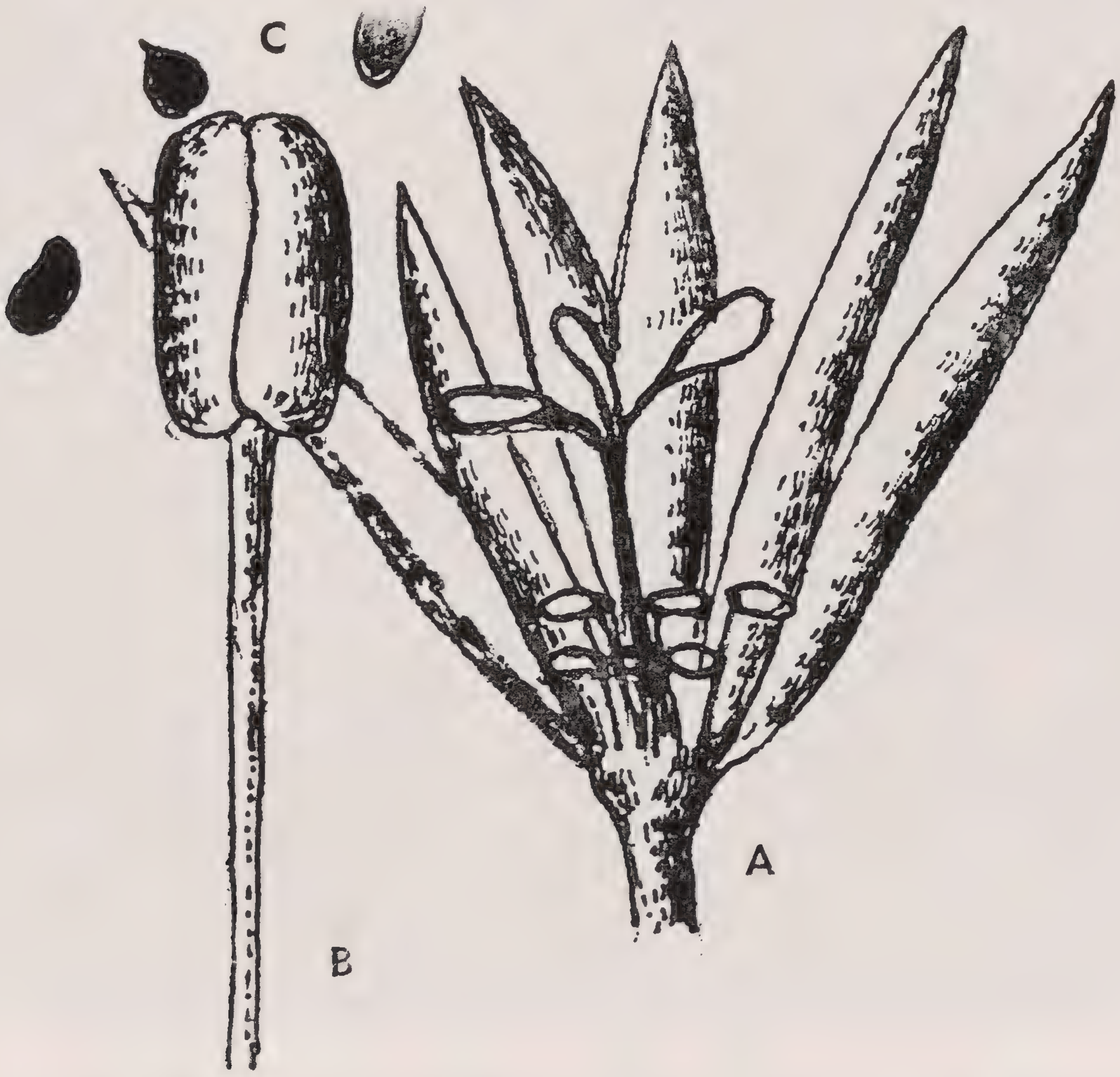

Fig. 14. **Pyrolirion xiphopetalum** (Baker) Sealy. **A.** Dissected flower **B.** Fruit. **C.** Seeds. All X 1.00

We do not know whether this pretty Amaryllid is now in cultivation. We never have seen it with leaves and do not know its native name in the Aymara language.

III. THE GENUS **CASTELLANOA** IN BOLIVIA

In the "GENERA OF AMARYLLIDACEAE" by Hamilton P. Traub, The American Plant Life Society, 1963, appears the Genus *Castellanoa* with the type species *C. marginata* (R. E. Fries) Traub. This plant was discovered by the Swedish botanist, R. E. Fries, at the "Puna" of Northern Argentina and diagnosed as *Hippeastrum marginata* in Act. Soc. Upsal. Ser. 4, 1(1), 161, 1905. Under our present knowledge of the Family *Amaryllidaceae*, obviously, this plant is not an *Amaryllis* (Syn.—*Hippeastrum*), because of its solid scape and the stamen characters. Traub states that the fruit and seeds of this taxon are unknown.

On the other hand, recently, Ing. A. T. Hunziker, in KURTZIANA, Tomo 5, 1969, Cordoba, Argentina, says that since the original description of *Hippeastrum marginata* R. E. Fries, nothing has been added about the taxonomic position of such a rare species, nor have original errors been corrected. However, Hunziker believes that the Genus *Castellanoa* appears to be a synonym of *Hieronymiella* because of its heteromorphic stamens which should be attached at their base.

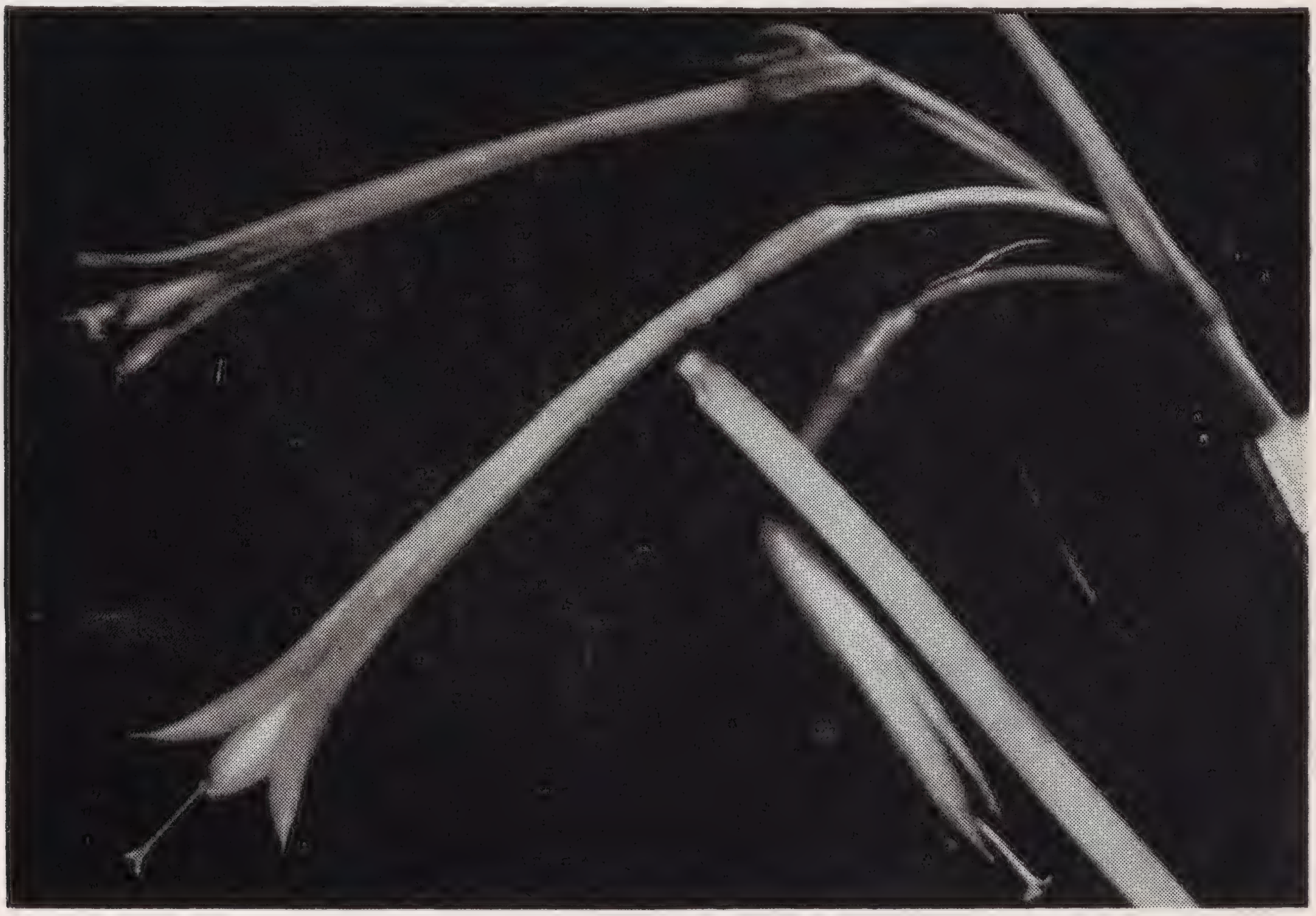

Fig. 15. **Castellanoa marginata** (R. E. Fries) Traub. Side view of umbel. Photo by Dr. Martin Cardenas.

Both authors believe that the taxonomic definition of this monotypic genus, must be studied on the basis of new material.

We saw this plant for the first time above Quechisla, Province of Nor Chichas, Department of Potosí, Bolivia, at the end of 1931. We sent an herbarium specimen of it to the late Dr. Cristobal Hicken in

Buenos Aires. He identified our material as *Hippeastrum marginata* R. E. Fries. Many years later in March 1949, we obtained bulbs of a similar plant without flowers, from near Cuchu Ingenio, 40 Km, N. E. Potosi. These came in flower, but we did not pay much attention to it until we had in hand the "GENERA OF AMARYLLIDACEAE" by H. P. Traub. Then we obtained new bulbs from the same locality and grew them. We had for study material of plants with leaves, flowers, fruits and seeds. On the basis of this study, we believe that *Castellanoa* Traub, is a good genus and we describe the especies *C. marginata* (R. E. Fries) Traub, as follows:

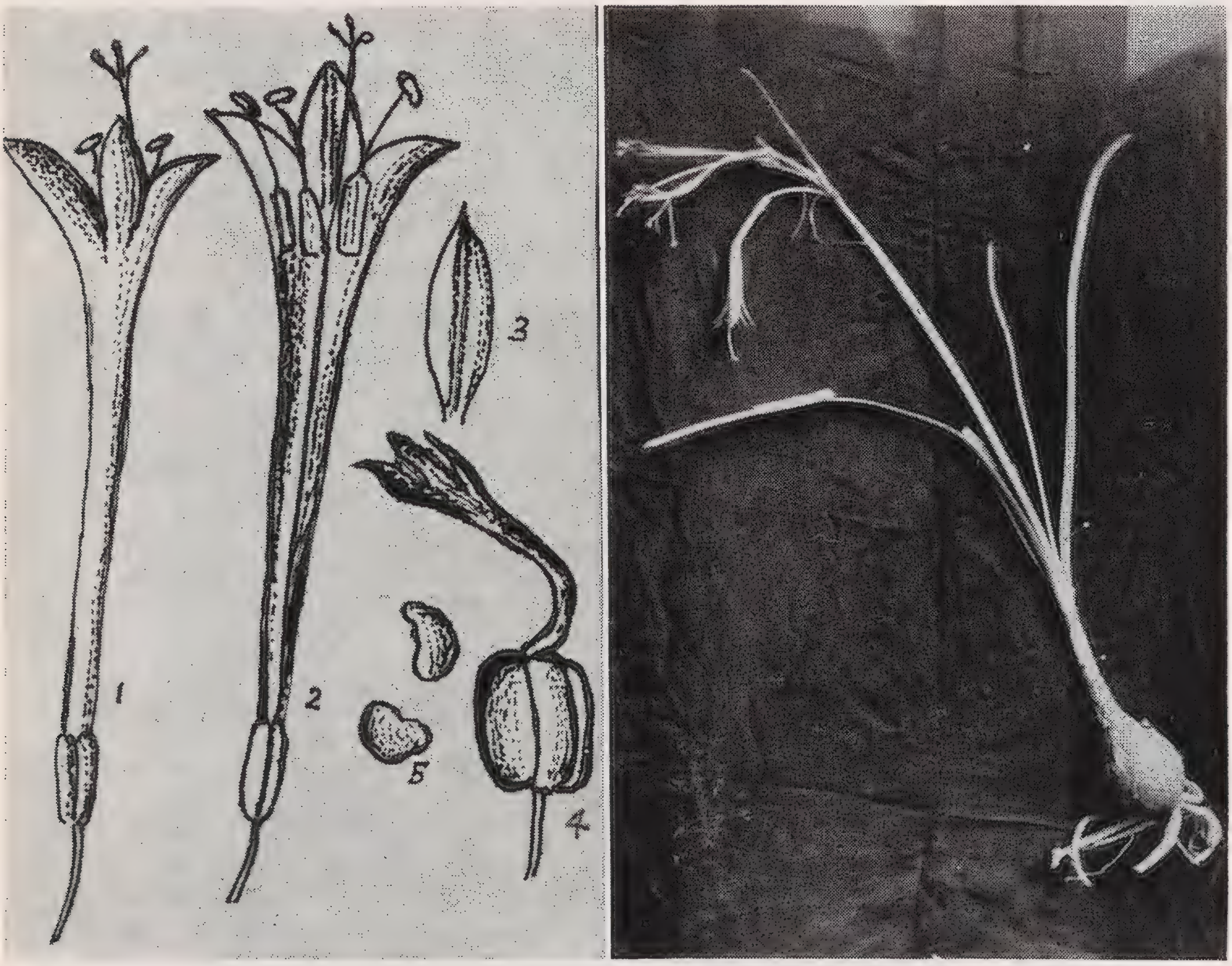

Fig. 16. **Castellanoa marginata** (R. E. Fries) Traub. **Left,** (1) side view of flower. (2) long section of flower. (3) tepalseg. (4) capsule. (5) seeds. **Right,** entire plant. Drawing and photo by Dr. Martin Cardenas.

Castellanoa marginata (R. E. Fries) Traub (Figs. 15 & 16)

Quechisla, 3,400 m and Cuchu Ingenio, 3,500 m.

Bulb ovoid 6-8 cm long, 4-5 cm in diameter. Neck 7 cm long or longer. Leaves sheathed 20-25 cm long, 7-10 mm wide, glaucous with hyaline and minutely toothed edges. Scape 23-25 cm long, solid, flattened about 8 mm wide at its base, glaucous green. Spathe 8 cm long, dark purple. Umbel 6-8 flowered. Pedicels 3.5-4 cm long, brownish green, darker at the base of flowers. Flowers, slightly and laterally pendulous. Ovary 12 mm long, trigonous, 4 mm broad. Tepaltube 5 cm long, 3 mm thick above ovary. Limb of flowers 2.5-3 cm. Perigone orange-yellowish at base, bright red above. Tepals lanceolate 2.5 cm long, 6 mm wide with a yellow middle strip inside. Stamens of two sizes, 3 short (about 15 mm long) and 3 long (about 18 mm), inserted in the tepaltube and flattened at base. The free section of filaments are more than twice the length of the expanded portion. Interior of the tepaltube, yellow. Style 8 cm long, light green to yellowish, longer than stamens. Stigma trifid light green with the lobes lacinulate. Capsules ellipsoid 2 cm long, 15 mm in diameter, trilocular with a persistent dry flower. Each locule containing 2 vertical piles of seeds. Seeds flat, lunate, 8-10 mm long, blackish slightly undulate at its margins.

The vernacular Amerindian name of this plant at Quechisla is ''Pharantuya''. We do not know whether this is a Quechua or Aymara word. However, there is another Amerindian name similar in its termination, ''Chacaltuya'' assigned to *Chlidanthus fragrans.*

NEW AMARYLLIS SPECIES

HAMILTON P. TRAUB

1. **AMARYLLIS DORANIAE** TRAUB, **SP. NOV.**

On one of his plant exploration trips to South America, in 1965, Mr. J. L. Doran discovered an *Amaryllis* L. species on an island in the estuary of the Rio Orinoco, Venezuela, at an elevation of approx. 100 ft. (30 m.). The outstanding feature of this species, belonging to the subgenus *Macropodastrum* Bak., is the clear rose color of the flowers. This is Doran collection No. 22 (see PLANT LIFE 26: 49. 1970). It is appropriate that this species be named for Mr. Doran's mother.

Amaryllis doraniae Traub, sp. nov.

Holotype: Specimen Doran, s. n.; Traub No. 1103 (TRA), grown from bulbs collected by Mr. J. L. Doran in Sept. 1965 on an island in the estuary of the Rio Orinoco, Venezuela; specimen flowered in the greenhouse for Mr. Doran at Burbank, Calif. May 19, 1970.

Bulbo rotundo 4 cm. diametro, collo 1.5 cm. longo; foliis sub anthesi vix evolutis, post anthesin plene evolutis; scapo 35.5 cm. longo; spatha 2-valvata; umbella (2—vel 3)—4-flora, floribus buccinatis, 12 cm. longis, 9.5 cm. per transversum faciem diametris inodoratis; tubo tepalorum 5 cm. longo viridi; segmentis tepalorum 8.1—8.8 cm. longis 2—2.9 cm. latis, parte inferiori 1/3 viridi, parte superiori 2/3 carmineo-roseo; pedicellis sub anthesi 3.2 cm. longis; staminibus quam segmentis tepalorum brevioribus; stylo segmenta tepalorum subaequanti vel paulo superanti; stigmate breviter trifido, lobis 1.5 mm. longis.

Bulb round, 4 cm. long, 4 cm. in diam., neck 1.5 cm. long, 2 cm. in diam. *Leaves* starting at flowering time (mid-May, Burbank, Calif.), fully developed after flowering. *Scape* hollow, glaucescent, light green, slightly flattened, 35.5 cm. long, 1.6 x 1.1 cm. at the base, 1.0 x 0.7 cm. at the apex. *Spathe-valves* 2, upright at first, reflexed at the middle at anthesis, yellowish-green, lanceolate, apex rounded, 5.7—6 cm. long, changing to dry brown; bracteoles short, very narrow. *Umbel* (2—3)—4-flowered; flowers 12 cm. long, at first held horizontally, later declined; long trumpet-shaped, 9.5 cm. across face; segs slightly reflexed toward the apex; tepaltube green, outside lower 1/3 of tepalsegs green, upper carmine rose (HCC 621/1), lighter carmine rose above, tipped light carmine rose to whitish, throat greenish-whitish, filaments and style white lower half, carmine rose above, *scentless.* *Pedicels* at anthesis 3.2 cm. long, green. *Ovary* oblong, 1.2 cm. long, 8 mm. in diam., green. *Tepaltube* trigonous, 5 cm. long, 7 mm. in diam. at the base, 1.3 cm. in diam. at the apex. *Tepalsegs* ruffled on the margins in upper reflexed part; top setseg 8.7 cm. long, 3.4 cm. wide, lanceolate, rounded-apiculate, 2 side setsegs 8.8 cm. long, 2.9 cm. wide, lanceolate, rounded apiculate, 2 side petsegs 8.1 cm. long, 2.8 cm. wide, lanceolate, bluntly acute, bottom petseg, 8.2 cm. long, 2 cm. wide, lanceolate, bluntly acute. Stamens fasciculate, slightly declinate, very slightly ascending, shorter than the tepalsegs; anthers cream-colored before anthesis, shrinking to 5 mm. long at anthesis, pollen yellow. *Style* straight to very slightly descending, sub-equaling or slightly overtopping the tepalsegs, stigma shortly trifid, lobes 1.5 mm. long.

Range.—Known only from the nomenifer locality, an island in the estuary of the Rio Orinoco, Venezuela, alt. prox. 100 ft. (30 m.).

Postscript.—Mr. Doran reports that he "found *Amaryllis doraniae* on Isla Redondo(?), in the area between Caña Macareo and Caña Mariusa in the Orinoco Delta; exactly where I do not really know because this area is one of those wet horrors with no landmarks [see the estuary of the Rio Orinoco in a good atlas]. It all looks alike. Only one clump was found. It would be reasonable to believe more could be found up-stream, no telling how far, possibly several hundred miles. We were probably 50—60 miles east of Pedernales near latitude 10° N." (Note.—the term "caña" here refers to "one of many streams of water in a delta.")

II. **AMARYLLIS BLOSSFELDIAE** TRAUB & DORAN, **SP. NOV.**

This charming new species of *Amaryllis* L. was collected originally by Mrs. Anita Blossfeld (Mrs. Harry Blossfeld) (see PLANT LIFE 22: 13. 1966) on the sand dunes near the Ocean beach at Praia do Sape, District of Maranduba, in the municipality of Ubatuba. Mr. Harry Blossfeld, who is cultivating a lot of 20 of these plants notes that the blooming season is as a rule a month or two later than that of *Amaryllis striata* var. *crocata,* and that the flowers have a more brilliant and intense cinnabar orange color (nasturtium red); as a rule the plants have longer flower scapes, and when the buds open, the spathe-valves have wilted; the pedicel length at anthesis is 7 cm. long as contrasted with 1.2—2.5 cm. long in *A. striata* var. *crocata.*

Collections of this species were also made by Mr. Blossfeld from the region of Mogi das Cruzes, 50 Kilometers east of São Paulo, on the railway to Rio de Janeiro, alt. 2500 ft. This area has a climate moister than São Paulo (City), with a decided rainy season, and a dry cold winter from April to August. It grows in an area that gets 80 inches of rain per year (2101 mm. by Government record); practically a tropical climate. In this region it rains during the dry season although much less than in the rainy season when the rains are daily and heavy, and the temperature is relatively high.

Mr. J. L. Doran has also collected this species south of Ubatuba along the Ocean beach (see Doran No. 32, PLANT LIFE 26: 50. 1970) at Coraguatatuba, in sand in swamps, alt. 100 ft. (30 m.), and the type description is based on the plants from this locality that flowered for Mr. Doran in the greenhouse at Burbank, Calif. in May 1970. For the chromosome count of this species by Love, et al., see article elsewhere in this issue.

It is fitting that this beautiful species be named in honor of Mrs. Harry Blossfeld who first collected this fine plant.

This species differs from *Amaryllis striata* var. *crocata* in the features indicated by Mr. Blossfeld as reported above, and other particulars such as the extremely long leaves, usually larger number of flowers per umbel, and so on, as indicated in the detailed description below.

Amaryllis blossfeldiae Traub and Doran, **sp. nov.**

Holotype: Doran s. n.; Traub No. 1004 (TRA), May 19, 1970, grown from bulb collected by J. L. Doran at Coraguatatuba, Brasil, October 1966; and flowered by Mr. Doran in the greenhouse at Burbank, Calif.

Bulbo rhizomatoso 8.5 cm. longo, 8.8 cm. diametro, collo 1.8 cm. longo; foliis usque ad 8 linearibus longissimis 73—78 cm. longis, supra mediam 2.5 cm. latis; scapo 33.5 cm. longo, quam affine A. striata var. crocata 1—2 menses postea florente; umbella plerumque 4- vel 5-flora, floribus pallide tropaeolo-rubris; pedicellis 3.7—5 cm. longis, post anthesin elongatis; tubo tepalorum 5 cm. longo; stylo quam staminibus longioribus; stigmate trifido, lobis 3 mm. longis.

Bulb 8.5 cm. long, 8.8. cm. in diam., neck 1.8 cm. long, 3.5 cm. in diam.; bulb coats light brown; rhizomatous. *Leaves* 3—5, linear, very long, 73—78 cm. long, 2.5 cm. wide at the base, 3.7—4 cm. wide above the middle, narrowing gradually to the bluntly acute apex, deep green, furrowed; old leaves declining at the time the 5 new leaves are sprouting (mid-May 1970, at Burbank, Calif.). *Scape* hollow, roundish, very slightly flattened in lower half, bright green, glaucous, 33.5 cm. long. *Spathe-valves* 2, long-lanceolate, bluntly acute, green at anthesis; bracteoles smaller, up to 6 cm. long, green. *Umbel* (3—)—4—5-flowered;

flowers similar to *A. striata* in shape but slightly smaller and slightly more irregular, 2 side setsegs slightly wavy; tepalsegs light nasturtium red, greenish or yellowish star in throat. *Pedicels* 3.7—4.4—5.0 cm. long, bright green, elongating greatly after anthesis. *Ovary* oblong, 1.7 cm. long, 7 mm. in diam. *Tepaltube* 5 cm. long, 5 mm. in diam. at the base, 8 mm. in diam. at the apex. *Tepalsegs:* top setseg spatulate, 8 cm. long, 2.8 cm. wide, apiculate; 2 side setsegs very slightly irregular, spatulate, 7.8 cm. long, 2.7 cm. wide, apiculate; 2 side petsegs very slightly irregular, 7.7 cm. long, 2.1 cm. wide, apex blunt; bottom petseg lanceolate, 7.4 cm. long, 1.2 cm. wide, apex blunt. *Stamens* declinate-ascending white in lower ½, pinkish above, anthers 5 mm. long at anthesis, pollen ash-gray. *Style* overtopping the stamens, white in lower ½, pinkish above; stigma trifid, lobes 3 mm. long, white on top.

Range.—The species has been collected on the sand dunes near the Ocean Beach at Praia do Sape, District of Maranduba, in the municipality of Ubatuba; and south of Ubatuba along the Ocean Beach at Coraguatatuba, and in the region of Mogi das Cruzes, 50 km. east of São Paulo, on the railway to Rio de Janiero, alt. 2500 ft.

III. **Amaryllis belladonna** L. ssp. **quentiniana** Traub & Whitaker, **ssp. nov.**

While on a plant exploration trip in Bolivia in early 1970, Dr. Thomas W. Whitaker and Dr. Quentin Stephen-Hassard collected a number of *Amaryllis* species. Dr. Stephen-Hassard located a dwarf *Amaryllis belladonna* subspecies about midway between Corioco and Caranavari in La Paz Province. The plant was growing on the face of a cliff above the road, and was very difficult to collect since the bulbs were buried deeply in the rock crevices, to a depth of 6—8 inches. A hand pick was necessary to dig them. They were scattered widely in deep shade. Apparently there was no vegetative multiplication, and it appears that the subspecies has to be propagated by means of seeds.

Bulbs of this collection were received by the writer, and flowered on July 4, 1970 at La Jolla, Calif. It was identified by the writer as a subspecies of *Amaryllis belladonna* L., and it was immediately apparent that this beautiful dwarf was an excellent addition to the germ plasm available for the breeder of short-statured hybrids. A small quantity of seeds was obtained in 1970 which was distributed. In another season it is hoped that more seeds will be available.

Since this beautiful dwarf was discovered and collected by Dr. Quentin Stephen-Hassard, who had gone to considerable effort to pry it loose from the rocky crevices, it is named in his honor.

Amaryllis belladonna L. ssp. **quentiniana** Traub & Whitaker, **ssp. nov.**

Holotype: Traub No. 1005 (TRA), grown from a bulb collected 3-8-70 by Drs. Whitaker and Stephen-Hassard, about midway between Corioco and Caranavari, La Paz Province, Bolivia. It bloomed July 4, 1970 at La Jolla, Calif.

Planta subparva; bulbo parvo 4 cm. longo, 3.5 cm. diametro, collo 1 cm. longo; foliis 4 viridibus ligulatis 12 cm. longis 2 cm. latis; scapo

9 cm. longo; spatha 2-valvata; umbella (1)—4-flora, floribus cinnabarinis, his A. belladonnae L. similibus sed parvioribus; pedicellis 2.3—2.7 cm. longis; tubo tepalorum 2.8 cm. longo; paraperigonio setis minutis albidisque intus basi segmentorum tepalorum composito; staminibus quam stylo brevioribus; stigmate capitato obscure 3-lobato.

Bulb small, up to 4 cm. long, 3.5 cm. in diam., neck 1 cm. long, 1.4 cm. in diam.; bulb coats medium brown. *Leaves* 4, strap-shaped, 12 cm. long, 2 cm. wide, green. *Scape* 9 cm. long, 9 x 12 mm. in diam. at the base, 6 x 8 mm. in diam. at the apex, hollow, somewhat compressed, green, glaucescent. *Spathe-valves* 2, lanceolate, 4.2 cm. long, acute, brown, dry at anthesis. *Umbel* (1—) 4-flowered; flowers vermilion (HCC 18/2), throat greenish-yellowish, whitish in upper part, markedly declined, and wide open as in *Amaryllis belladonna* L., but much smaller, and blooming at a different season. *Pedicels* 2.3—2.7 cm. long at anthesis, green. *Ovary* trigonous, 8 mm. long, 5 mm. in diam., green. *Tepaltube* 2.8 cm. long, 4 mm. in diam. at the base, 10 mm. in diam. at the apex. *Paraperigone* of minute whitish bristles at the base inside of tepalsegs, and throat. *Tepalsegs:* top setseg broadly elliptic, 6.3 cm. long, 3.3

TRAUB—NEW AMARYLLIS SPECIES—continued on page 28.

COLLECTING AMARYLLIS IN THE BOLIVIAN YUNGAS

THOMAS W. WHITAKER

During March 1970, Dr. Q. M. Stephen-Hassard, a retired dentist of La Jolla, California, and I collected Amaryllis in Bolivia. We spent about one week in the Yungas east and slightly north of La Paz and about 4 days in the area around Cochabamba. We made 8 collections in the course of our trip. (See summary, Table 1.) The account that follows is an attempt to place on record the precise site of the collections, the tentative identification of each collection, a description of the habitat and any peculiarities of the plants noticed at the time of collection. The map (Fig. 17) indicates the route of our journey.

The Yungas east and north of La Paz lie at an altitude of 2000-9000 ft., and are essentially a series of deep canyons, slashed in the flanks of the Andes, as water from the towering eastern Cordillera rushes toward the Amazon Basin. The scenery is stunningly spectacular. The canyon walls are steep and for the most part densely forested. There are innumerable waterfalls that cascade down the steep canyon walls to the streams below. To a native of the arid Southwestern United States the scenery has an ''out of this world'' appearance, and is almost indescribable in grandeur.

Two collections were made in the vicinity of Cochabamba, Bolivia. Cochabamba lies at an altitude of about 8000 ft. It has a pleasant climate, and is the center of a potentially rich agricultural area. While in Cochabamba we were the guests of Prof. Martin Cardenas, and he directed our collecting activities.

Table 1. Summary—**Amaryllis** species collected in La Paz and Cochabamba Provinces, Bolivia, in February and March 1970.

Collection number *	Collection date	
1	3- 6-70	**Amaryllis escobar-uriae.** 8 km. downstream from Unduavi, La Paz, Bolivia.
2	3- 6-70	**Amaryllis yungaensis.** Rio Solcame, La Paz, Bolivia.
3	3- 7-70	**Amaryllis escobaruriae.** Left side of river at Puente Villa, La Paz, Bolivia.
4	3- 7-70	**Amaryllis pardina.** Right side of river at Puente Villa, La Paz, Bolivia.
5	3- 8-70	**Amaryllis belladonna** ssp. **quentinana.** About one-half distance between Coroico and Caranavi, La Paz, Bolivia.
8	3- 9-70	**Amaryllis escobar-uriae.** 3 km. from Sacramento on road between Undavi and Coroico, La Paz, Bolivia.
13	3-13-70	**Amaryllis cybister.** On dry stony hillside near Rio Chapare, on road between Cochabamba and Punata, Cochabamba, Bolivia.
14	3-14-70	**Amaryllis mollevillquensis.** Collected originally by Dr. Cardenas in village of Mollevillque, Cochabamba, Bolivia.

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* U. S. Plant Introduction (PI) numbers will be given after the species have been verified and/or identified.

COLLECTION 1—MARCH 6, 1970

Tentative identification—Amaryllis escobar-uriae (according to Dr. Martin Cardenas).

Location—about 8 km. downstream from Undavi, La Paz, Bolivia (El Chaco—Cardenas). On the opposite side of the canyon, facing a tremendous waterfall.

Habitat—growing mostly in unshaded areas, in rich fertile black soil in crevices on the face of steep cliff.

Plant description—long strap shaped leaves; bulbs ½-2″ in diameter, growing in clumps; apparently reproducing vegetatively and by seed. One plant had inflorescence almost ready to open.

COLLECTION 2—MARCH 6, 1970

Tentative identification—Amaryllis yungaensis Card.

Location—on Rio Solocame, where road crosses river on way to Irupana.

Habitat—above river, in dark, rich soil of rock crevices, in deep shade, with many other plants (begonias, bromeliads, fuschias, etc.) on a steep jungle hillside. Plants difficult to collect, almost inaccessible, in widely scattered individual clumps.

Plant description—long strap-shaped leaves; bulbs ¼ to 2″ in diameter. Apparently reproducing both vegetatively and by seed.

COLLECTION 3—MARCH 7, 1970

Tentative identification—Amaryllis pardina (Hook. f.) Lem.

Location—at Puente Villa where road crosses the river by bridge. No. 3 bulbs on left side of river driving toward Caranavi.

Habitat—on face of steep cliff, growing in dark, rich soil in shaded crevices with begonia and many other plants; damp, heavy shade.

Plant description—medium width and length strap-shaped leaves; bulbs ½ to 2″ in diameter; plants scattered and comparatively rare.

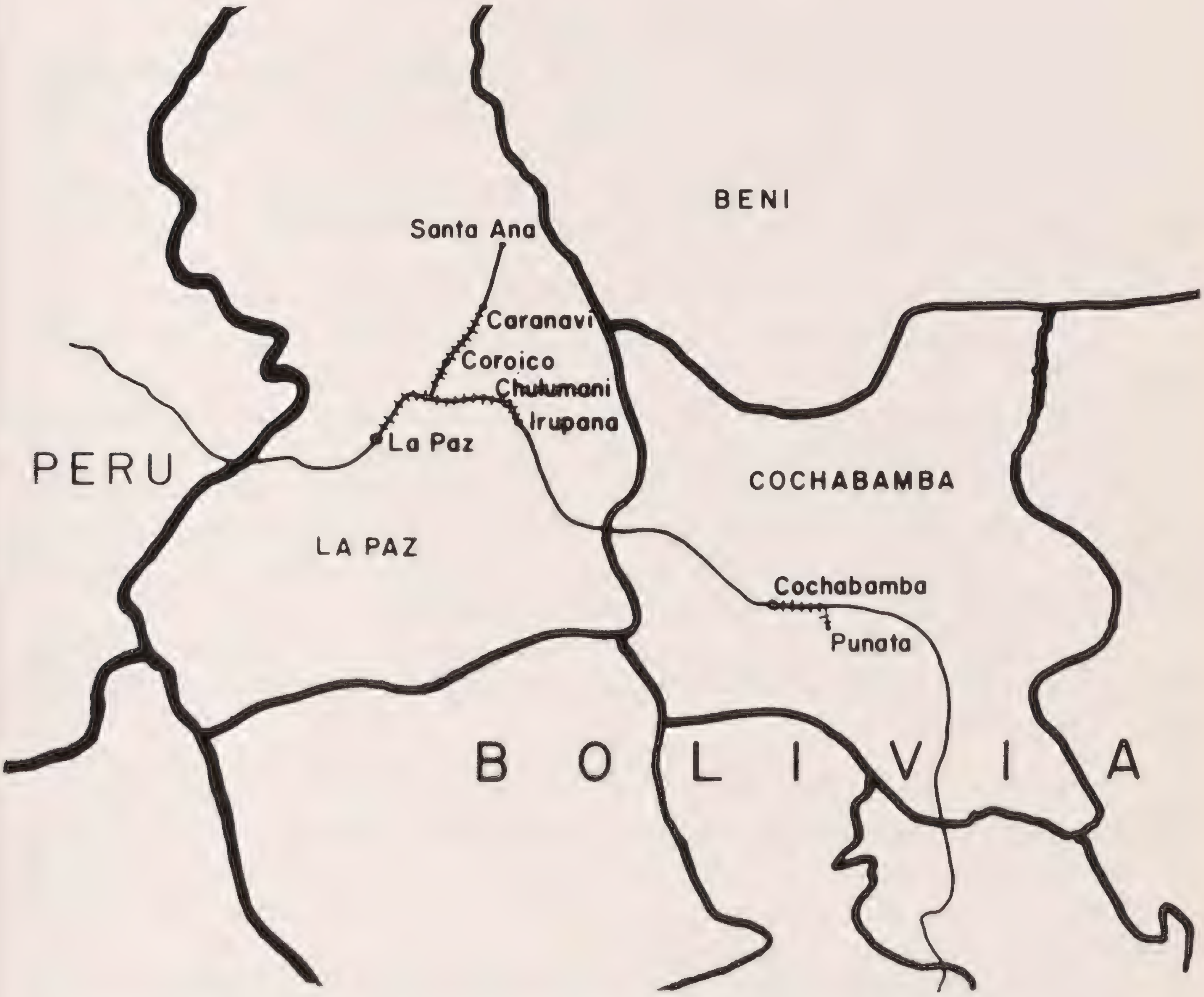

Fig. 17. Map of a small portion of Bolivia showing parts of the provinces of La Paz, Cochabamba and Beni. The cross-hatched lines show the route followed by the Whitaker—Stephen-Hassard party to collect Amaryllis; March 1970.

COLLECTION 4—MARCH 7, 1970

Final identification—Amaryllis escobaruriae Card.

Location—at Puente Villa where road crosses the river. No. 4 bulbs on right side of river driving towards Caranavi.

Habitat—growing on face of cliff, but not in densely shaded areas.

Plant description—medium length and width strap-shaped leaves;

bulbs ½-2″ in diameter. Many plants—easily collected; may be different species from that on left side of the river.

COLLECTION 5—MARCH 8, 1970

Identification—Amaryllis belladonna L. ssp. *quentiniana* Traub and Whitaker. See preceding article.

Location—about one-half distance between Coroico and Caranavi, La Paz, Bolivia.

Habitat—growing on face of cliff above road; very difficult to collect; bulbs buried deeply in crevices, 6 to 8″, a hand pick necessary to dig them; scattered widely in deep shade.

Plant description—medium size, strap-shaped leaves; bulb small, ½ to 1″ in diameter; bulbs grow singly; apparently no vegetative multiplication; must be propagated by seeds.

The plants were first located by Dr. Stephen-Hassard as members of the party searched the cliffs and jungle for *Amaryllis.*

COLLECTION 8—MARCH 9, 1970

Tentative identification—Amaryllis escobar-uriae (from Martin Cardenas).

Location—3 kilometers from Sacramento (down Chuspi-Pata) on road between Undavi and Coroico, La Paz, Bolivia.

Habitat—growing in large scattered clumps on face of vertical cliffs, in deep shade, mostly drenched continuously with mist from adjacent waterfall. Difficult to collect; finally reached large clump in flower by climbing on the top of the cab of a passing truck.

Plant description—long strap-shaped leaves; bulbs 2 to 3″ in diameter; elongate shaped bulb; plants in flower very attractive; white and scarlet corolla.

COLLECTION 13—MARCH 13, 1970

Tentative identification—Amaryllis sybister (Herb.) T. & U. (confirmed by M. Cardenas).

Location—on Rio Chapare, road between Cochabamba and Punata, Cochabamba, Bolivia (type locality).

Habitat—growing above river in extremely dry environment, buried 6 to 8″ in soil, no shade, with other xerophytic plants such as cactus.

Plant description—medium length strap-shaped leaves; bulbs 4 to 5″ in diameter, 6-8″ in length; grows in small colony of approximately 25 plants; evidently propagated vegetatively. We searched the area thoroughly but found *only* this single colony.

COLLECTION 14—MARCH 14, 1970

Tentative identification—Amaryllis mollevillquensis Card. (confirmed by Martin Cardenas).

Location—collected originally by M. Cardenas in the village of Mollevillque, Cochabamba, Bolivia.

Habitat—unknown; growing in pot in patio of Dr. Jose Marquez.

Plant description—short, rather wide, strap-shaped leaves; scape arises from naked bulb; scape about 1′ in length; beautiful dainty, cardinal flower; specimen given to me by Dr. Marquez, inflorescence about ready to open.

ECUADORIAN AMARYLLID BLOOMS IN ILLINOIS

William R. Adee, *961 Sunset Ave., Waukegan, Illinois 60085*

A package of native amaryllids arrived on May 9, 1969 from Dr. Elizabeth Naundorff of Quito, Ecuador. Included were *Bomarea, Callipsyche,* and *Stenomesson aurantiacum.* The latter two species have similar bulbs and were mixed together. One group of bulbs sent up scapes almost immediately upon being potted in a 12″ pan in garden soil. The flowers opened on June 23. They were tubular coral colored with apple green segments, long lasting. Pods were set from self pollinations. Leaves followed the flowers. They were petiolated, about 9 inches long of a shiny green.

I assume from Dr. Naundorff's comments that they must have a dormant period in their native land. Mine have remained evergreen in the greenhouse, but those I sent to one friend in Burbank, Calif. went dormant after forming one leaf. Dr. Naundorff stated ''You know *Callipsyche* and *Stenomesson* are like *Colchicum;* first one leaf, then leaf gone, develops a flower.''

These bulbs are being grown in Texas, Minnesota, and other places in California.

The *Bomarea* has not bloomed, but prospers in the greenhouse. It has climbed from the bench to the roof. It grows in an 8 inch pot in ''Baccto Potting Soil'', kept constantly moist.

The fourth amaryllid in the package is probably an escape *Agapanthus* from a ranch. It is starting to grow after six months of inactivity.

VACATIONING IN MEXICO WITH A BULB COLLECTOR

Mrs. David E. Wilson, *2719 Palm Circle West, Galveston, Texas 77550*

Early in 1970, my husband and I decided our three children were old enough to travel for a few days in the interior of Mexico. With a growing interest in the rain lily tribe, I particularly wanted my mother, Mrs. Morris Clint of Brownsville, Texas, to act as a guide and instructor over a route that would be both interesting and probably fruitful for collecting. The heaviest blooming season for these bulbs is usually April-June, but because of earlier commitments, we planned our trip for the first week in July. The rainy season is usually unpredictable. Some of the essential supplies on our list were: comfortable clothing, distilled water, cameras, trowels, rock hammer, small shovel, clean paper sacks of assorted sizes, rubber bands, scissors and a day book for notes. Besides the usual border crossing papers, we had to apply to the U. S. Department of Agriculture for a plant collecting permit.

Our first stop from Brownsville was Cuidad Mante. While there we enjoyed the tropical plants, birds and butterflies, and purchased excellent sweet bread, rolls, avocados and mangoes to supplement lunches. From Mante we connected with Highway 80 at Antiguo Morelos for San Luis Potosi, noting speedometer reading in day book. The first *Zephyranthes* we found (and the only one in bloom on the trip) was a pale yellow 29 miles west of Antiguo Morelos in a valley just east of El Naranjo. Most of these were growing in a bar pit filled with water, but we managed to locate others without getting wet. For the next ten miles we traveled through the wet part of the mountain, with its tall oak trees, orchids, Bromeliads and other tropical growth. When we stopped for lunch, Mother found *Zephyranthes* growing across the road on the mountain ledge. She had promised *Zephyranthes* in leaf in these ''Z. clintiae mountains'' and she knew what she was talking about. We stopped several more times on the dry side of this mountain range and once more on a steep limestone hill just a few miles east of Huisache, each stop yielding one or more species or variation of species in leaf.

We decided to spend two nights in San Luis Potosi in order to make a morning trip on Highway 80 on the way to Guadalajara in search of the original collecting place of *Habranthus concolor*, rediscovered in 1954 by my parents and Mr. Fred Jones of Corpus Christi (Herbertia, 1955). As we made our approach to the first mountain right outside of town, a truck with liquified petroleum gas tried to pass our car and a truck with a large bus coming down the mountain in his path. My husband, a novice in mountain driving, quickly pulled to a spot on a small hill to let the trucks resolve their problem. We collected a narrow-leafed *Zephyranthes* at this location, immediately dubbed ''Pollo Hill.'' This short mountain stretch is pretty rugged and made worse on our drive with road repair and loose gravel. Once we reached the plateau, we found several *Zephyranthes* and *Habranthus concolor* in leaf at different locations between 19 and 23 miles from the traffic circle in San Luis Potosi. The *Habranthus* were quite small from lack of rainfall. Some of these desert soils puzzled me. They could be brick hard on the surface, but somewhat moist and loamy sand several inches below. Rocks make digging difficult.

My next lesson in collecting bulbs in Mexico began our second afternoon in San Luis Potosi. While my husband entertained the children at the swimming pool, Mother and I began to prepare our collection to be passed by the U. S. Department of Agriculture. Using scissors, we carefully cut roots and leaves from each bulb and removed old and loose scales. Each group of bulbs was then carefully washed to remove any trace of soil and placed on newspaper to dry overnight (with collection number for identification). The next morning it was a simple matter to mark clean paper sacks with collection number, number of bulbs, and refer to notebook for locality and family identification.

We left the city on Highway 86 to Valles. About 10.8 miles from the traffic circle in San Luis Potosi we stopped at another Clint collecting spot for *Habranthus concolor.* Here the bulbs were not only plentiful, but in full summer growth and easy to dig. We had missed their bloom by several weeks, for the last seed capsules were ripening. On the way back to the car we dug several bulbs of *Zephyranthes* in leaf. Leaving the plateau and entering the mountains, we were threatened by scattered thunderstorms, but managed to miss each shower. Rains must have started in mid-June over the territory we covered, for even the driest desert areas showed spots of green. We had planned a lunch and collecting stop at Valle de Fantasmas (approximately 30 miles from traffic circle), which is a place that should please anyone for scenic beauty. Green forests are broken by cleared spots of green carpet and red soil. Across the Valley can be seen the reason for its name: huge outcroppings of light grey stone, elongated and weathered like statues. We dug *Habranthus* growing deep under large rocks and roots, usually in the shade. A *Zephyranthes* in leaf was found in the more open sunny spots.

As we continued to climb in the mountains, we were treated to the sight of a majestic Mexican eagle gliding in the sky to our left. My husband muttered ''what's he doing so high'', but by this time he was almost used to mountain driving. When we entered the drier part of the mountains, Mother put out a call for the next pull-out place. This happened to be fenced, but we managed to find a few bulbs near the road. From here (52.1 miles from S.L.P.) to Valles was new collecting territory for Mother, but this didn't seem to handicap her. As soon as she began to see outcroppings of limestone, she again put out the ''call.'' After we dug what *Zephyranthes* we wanted, she explained that some of the prettiest Mexican rain lilies seek out soils with limestone or volcanic rock, or both. These bulbs were not deep, but we had to use a rock pick to get them. Our last collection (114 miles from S.L.P.) was found in the wet mountains. The upper part of the mountain was fenced, but we dug a few *Zephyranthes* from under rocks and between crevices. Our last stop for the day, where the soil was red clay and rocky, was a dud. Not a rain lily in sight, even though the territory looked perfect and the fields were covered with *Nothoscordum* in bloom. I was about to tease Mother about her ''miss'' when my husband pointed to a sign on a nearby building—''Flor de Mayo—one of the names used in Mexico for Rain Lily! Perhaps we will find them here next time.

[See also page 12, Editor's Mail Bag.]

SEEDS OF **AMARYLLIS RETICULATA** L'HERIT.

J. L. Doran, *1117 North Beachwood Drive, Burbank, California 91502*

In 1969, *Amaryllis reticulata* L'Hérit. (see Fig. 18) capsules matured in my greenhouse. The individual seeds were attached to the inside of the capsule by fine hair-like strands (placentae) and no amount of agitation dislodged them. Seeds left in the capsule for two weeks dehisced, but the outer seed coats did not wrinkle. The seeds are round or roundish, hard, shining, black, 8x9mm. in diam.

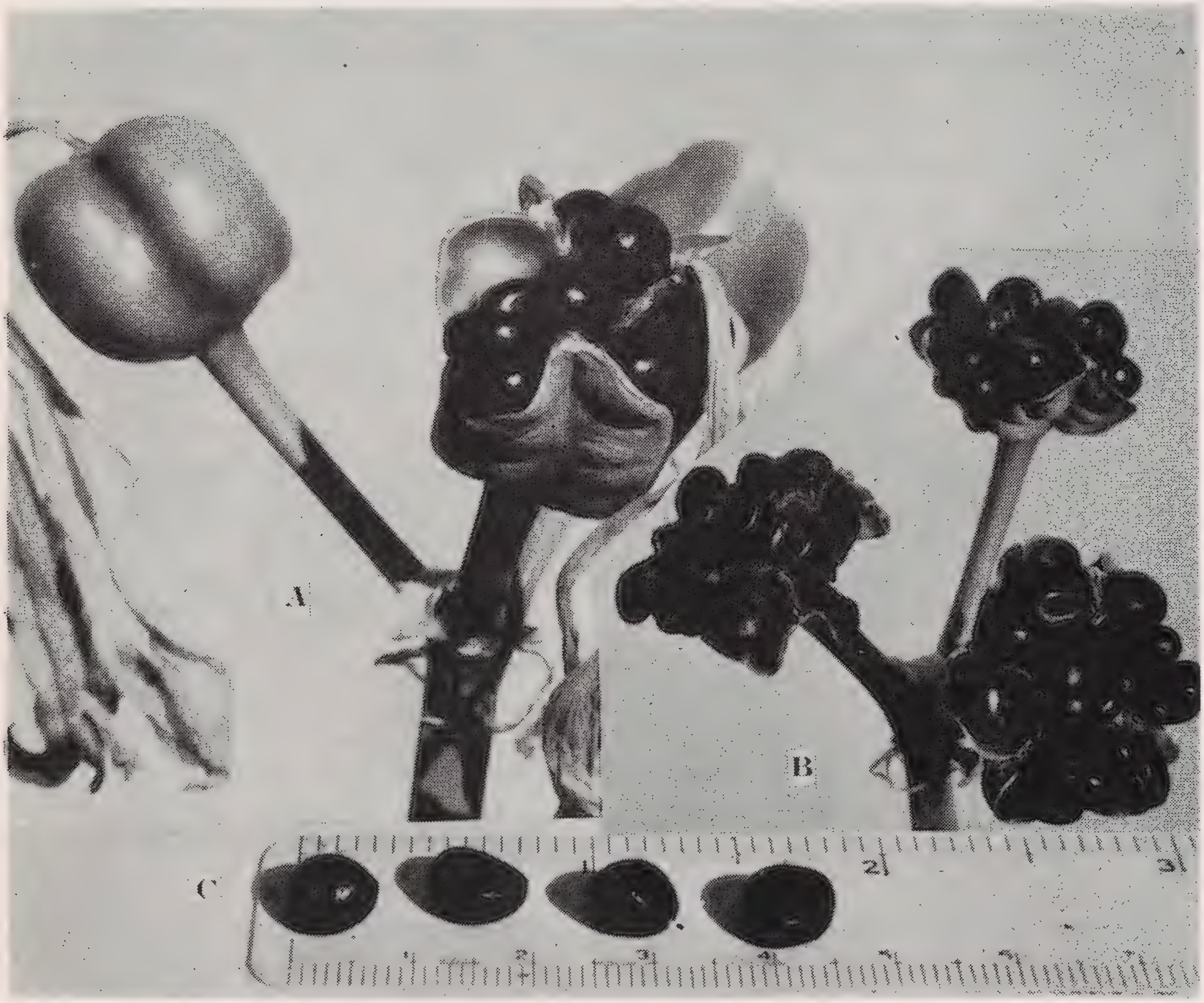

Fig. 18. **Amaryllis reticulata** L'Hérit. Capsule and seeds. A. Unopened capsule, and capsule just opening. B. the same 10 days later. C. Black, roundish, hard seeds. Photo by J. L. Doran.

Seeds planted as soon as the capsule opened germinated promptly when planted. Seeds allowed to remain in the capsule for some time required from two months to about a year to germinate.

The plant, Doran-24, which produced the seeds was collected in Brasil, at Relito ci de Vordas, Km. 150, near creek, alt. 4,000 ft.

CHROMOSOMES OF **ALLIUM EUROTOPHILUM** WIGGINS (CONTINUED)

Lee W. Lenz, *Rancho Santa Ana Botanic Garden, Claremont, California 91711*

In the 1969 PLANT LIFE, the Chromosome number, 2n=14, for *Allium eurotophilum* Wiggins, was reported (PLANT LIFE Vol. 26: 68—69, 1970). However, the reproduction of the photoprint of the chromosomes was lost in transit to the engraver, and the intended Fig. 17 for the 1969 issue could not be included. It is reproduced here in the 1970 edition as Fig. 19.

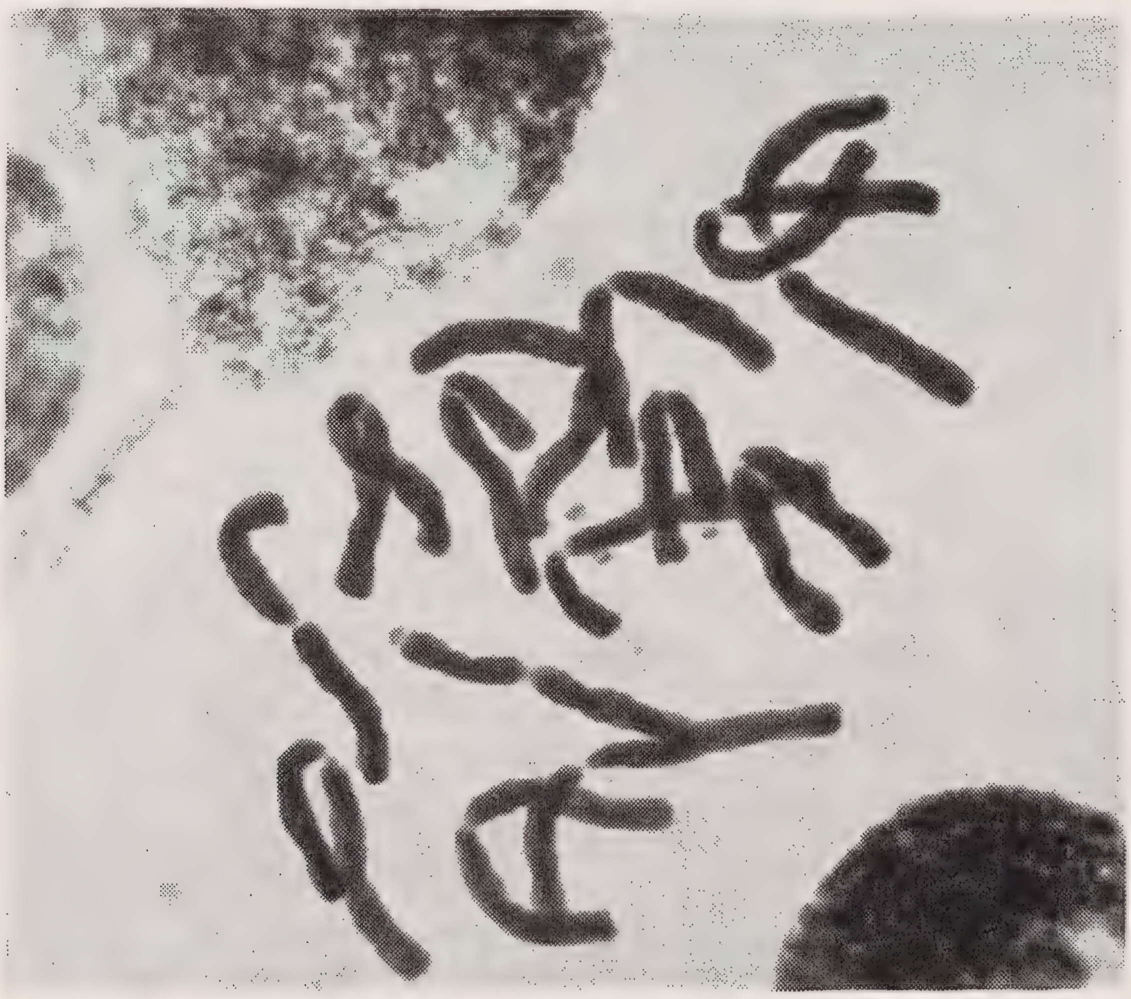

Fig 19. **Allium eurotophilum** Wiggins. Root-tip (2n) chromosomes. See text, PLANT LIFE 26: 68-69. 1969.

THE DR. RUPPEL AMARYLLID COLLECTIONS

Paul H. Williams, Jr., *6128 Sundown Drive, Fort Worth, Texas 76114*

Amaryllis angustifolia, the aquatic species, bloomed again in 1970, right on schedule. Last winter (1969) I allowed the pot to dry out when the foliage started to yellow. The plant remained dormant and leafless all winter until water was applied in late January. Leaf sheaths of about 6 inches in length came up and the leaves appeared between them. A bud soon became apparent but as the leaves continued to grow, the bud decayed. In February another bud started up and this one finally produced an umbel of six flowers. Several pollens were tried with negative results; however, one bloom did set seed from its own pollen. The seed were sent to Dr. Ruppel as he had lost all his bulbs and would not at present be able to collect any more of them. When this species first bloomed in 1969 it proved to be different from the dried specimen which had led to its discovery. That one still remains to be rediscovered.

While reading Alice M. Coat's interesting book, ''The Plant Hunters,'' I became amused when she posed the question if the plant explorer, in the classical sense, had ceased to exist due to civilized man having become resident in all parts of the globe. My mind pictured Dr. C. Gomez Ruppel's description of his finding a species of *Amaryllidaceae* which he labeled *Rhodophiala* ''Estanislao del Campo''. ''On the way from Embarcacion, Salta to Formosa, capital of the same province, a 36 hour trip, the train stopped in E. del Campo. Looking at the field from my cabin. I saw myriads of amaryllid leaves, just growing at the sidewalk! At once, I jumped out of the train, with my small spade and dug up as many bulbs as I could, before the train started moving.'' Bulbs of this collection bloomed in 4 inch pots in Fort Worth the following spring. I called the flower ''*Habranthus brachyandrus*,'' due to the pale orchid petals and the deep purple throat. This must be a dwarf variety of that species.

Among the *Amaryllis* L., species Dr. Ruppel has sent to the U.S. are the following:

A. *aglaiae*—collected at Tafi del Valle, Tucuman, Argentina.

A. ''red cochuna''—a red form of A. aglaiae collected near the Cochuna River, Tucuman, Argentina.

A. *petiolata*—collected at Santo Tome, Corrientes, Argentina.

A. ''aulica Reitz''—seed of species collected by Dr. Raulino Reitz of Brazil.

A. ''belladonna var. minor''—from cultivation in Formosa, Argentina.

A. ''elegans, var. albostriata''—collected at Pozo del Tigre and at Palo Santo, Formosa, Argentina.

A. *flammigera*—collected in Tucuman, Argentina.

A. *moreliana*—seed of collected bulbs.

A. *vittata*—seed collected from cultivation in Sao Leopold, Brazil.

A. *vittata* var. *tweediana*—seed of bulbs collected in Bolivia.

A. ''brown''—seed of A. *papilio* (See PL 1970, Page 82).

A. ''curitiva''—collected in state of Parana, South Brazil.

A. ''orange Reitz''—stoloniferous species from Santa Catarina, Brazil. Collected by Dr. Reitz.

A. ''satipo''—miniature species.

A. ''yanellosianum''—collected at ''Old Tucuman Road'', Salta, Argentina.

A. ''Chamical''—The Hill—collected near Chamical, a small town 35 kms. from Salta City, Argentina.

Many bulbs of various Amaryllids have been collected by this avid modern-day plant collector and living specimens of many of them have been sent to areas of the United States to give us the pleasure of seeing the beauty of his native flora. Species of *Rhodophiala, Habranthus, Zephyranthes, Hymenocallis, Crinum, Eustephia, Hieronymiella, Phycella,* and others have been included in his shipments. Dr. Ruppel is a true horticulturist whose great joy is to share his plants with others.

The Amaryllis Society could have made no better choice for the award of the 1971 Herbert Medal. I am very pleased at his selection.

NOTE ON **CRINUM BULBISPERMUM** (BURM.) MILNE-REDHEAD & SCHWEICKERDT

HAMILTON P. TRAUB

Crinum bulbispermum (Burm.) Milne-Redhead & Schweickerdt (the subject of our cover) is a very variable species ranging from the Cape to the Transvaal in South Africa; all, as contrasted with other *Crinum* species, are relatively frost hardy, but those from the Transvaal are the hardiest of all. From the writer's observation, those from the Cape are as a rule not very deeply seated in the ground and the bulb scales remain fibrous, but those from the Transvaal are quite deeply situated in the soil and are subject to the formation of secondary cartilaginous thickening of the bulb scales as in some species of *Brunsvigia*. The forms cultivated at my home show this great variation. In the southern forms, the flower color ranges from white, pink, to medium red, and those from the Transvaal vary in color from pinkish, medium red, to very deep purplish red.

In all cases the plant can withstand considerable cold as indicated. Although the top portions may be destroyed, the underground parts are uninjured, and the plant soon recovers. In contrast, *Crinum gouwsii* (see PLATE LIFE Vol. 10: 38—41, Plate 8. 1954) is easily affected by cold and it is frozen to the ground when *Crinum bulbispermum* is not harmed.

The cover by Prof. Goff pictures a plant native to the Transvaal. It shows the usual vigorous growth. It is a seedling (from the stock sent to the writer by Mr. Leon Boshoff-Mostert several years ago) grown by Dr. Thomas W. Whitaker.

AMARYLLID NOTES, 1971

HAMILTON P. TRAUB

Stenomesson herbertianum (Spreng.) Traub, *comb. nov.* Syn.—*Stenomesson flavum* Herb., App. Bot. Reg. 40. 1821, non *Pancratium flavum* R. & P. Fl. Peruv. 3: 54, 284. 1794, Herb. Amaryll. 198, pl. 28, f. 1. 1837; *Pancratium herbertianum* Spreng. Syst. Veg. IV. Cur. Post. 132. 1828; *Stenomesson latifolium* Herb. Bot. Mag. pl. 3803. 1841; *Chrysiphiala flava* (Herb.) Ker-Gawl., in Bot. Reg. pl. 778.; *Pancratium* *curvidentatum* Steud. Nom. II. 2: 250. 1840-41; *Stenomesson vitellinum* Lindl. in Bot. Reg. pl. 2. 1843.

Stenomesson flavum (R. & P.) Traub, *comb. nov.* Syn.—*Pancratium flavum* R. & P., Fl. Peruv. 3: 54, 284. 1794; *Pancratium croceum* Savign., in Lam. Encyc. 4: 725. 1795 (err. typ. 735); DC. in Red. Lil. 4: pl. 187. 1807; *Stenomesson croceum* (Savign.) Herb., Amaryll. 119, pl. 28, f. 4. 1837; *Stenomesson ruizianum* Kunth, Enum. Pl. 642. 1843; *Neaera crocea* (Savign.) Salisb., in Gen Pl. 109. 1866.

Subg. *Plagiolirion* (Bak.) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Plagiolirion* Bak., Gard. Chron. 38 (1883) ii.

Subg. *Mathieua* (Klotsch) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Mathieua* Klotzsch, in Otto & Dietr. Allg. Gartenz. 21: 337-338. 1853.

Subg. *Calliphruria* (Herb.) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Calliphruria* Herb., Bot. Reg. Misc. No. 87. 1844.

Subg. *Eucharis* (Planchon et Linden) Traub, *subg. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.) Syn.—Genus *Eucharis* Planchon et Linden, Cat. Hort. Ann. 8: 3. 1852; Flore des Serres 8: 107-108. 1853.

Urceolina edentata (C. H. Wright) Traub, *comb. nov.* Syn.—*Urceocharis edentata* C. H. Wright, Kew Bull. 24. 1910.

Urceolina x *clibranii* (T. M. Masters) Traub, comb. nov. Syn.—*Urceocharis* x *clibranii* M. T. Masters, Gard. Chron. ii (1892) 214, fig. 36.

Urceolina horsmannii (Baker) Traub, *comb. nov.* Syn.—*Plagiolirion horsmannii* Bak., Gard. Chron. ii (1883) 38.

Urceolina fosteri (Traub) Traub, *comb. nov.* Syn.—*Eucharis fosteri* Traub, Plant Life 7: 36. 1951.

Urceolina hartwegiana (Herb.) Traub, *comb. nov.* Syn.—*Calliphruria hartwegiana* Herb. Bot. Reg. Misc. No. 83. 1844.

Urceolina tenera (Bak.) Traub, *comb. nov.* Syn.—*Calliphruria tenera* Bak., Amaryll. 112. 1888.

Urceolina subedentata (Benth.) Traub, *comb. nov.* Syn.—*Eucharis subedentata* Benth, Gen. Pl. 3: 731. 1883.

Urceolina bouchei (Woodson & Allen) Traub, *comb. nov.* Syn.—*Eucharis bouchei* Woodson & Allen, Ann. Missouri Bot. Gard. 24: 181. 1937.

Urceolina lowii (Bak.) Traub, *comb. nov.* Syn.—*Eucharis lowii* Bak. Gard. Chron. 13(1): 538-539, Fig. 78. 1893.

Urceolina sanderi (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* Bak., Bot. Mag. pl. 6676. 1883 (Mar. 1).

Urceolina sanderi ssp. *multiflora* (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* var. *multiflora* Bak. Bot. Mag. pl. 6831-B. 1885.

Urceolina grandiflora (Planch. et Linden) Traub, *comb. nov.* Syn.—*Eucharis grandiflora* Planch. et Linden, Flore des Serres I. ix. 255. pl. 957. 1853-54.

Urceolina himeroessa (Sandwith ex Standley) Traub, *comb. nov.* Syn.—*Eucharis himeroessa* Sandwith, Herbertia 3: 74. 1936.

Urceolina lehmannii (E. Regel) Traub, *comb. nov.* Syn.—*Eucharis lehmannii* E. Regel, Gartenflora 38: 313-314, pl. 1300, f. 1 & 1b. 1889.

Urceolina mastersii (Bak.) Traub, *comb. nov.* Syn.—*Eucharis mastersii* Bak. Bot. Mag. pl. 6831-A. 1885.

Urceolina bakeriana (N. E. Brown) Traub, *comb. nov.* Syn.—*Eucharis bakeriana* N. E. Brown, in Gard. Chron. i (1890) 416, fig. 61.

Urceolina candida (Planchon et Linden) Traub, *comb. nov.* Syn.—*Eucharis candida* Planchon et Linden, Cat. Hort. Ann. 8: 3. 1852; et Flore des Serres 8: 107-108, pl. 188. 1853.

Urceolina butcheri (Traub) Traub, *comb. nov.* Syn.—*Eucharis butcheri* Traub, Plant Life 23: 60-69. 1967.

Urceolina bonplandii (Kunth) Traub, *comb. nov.* Syn.—*Hymenocallis bonplandii* Kunth, Enum. Pl. 5: 666. 1850.

Urceolina galanthoides (Klotzsch) Traub, *comb. nov.* Syn.—*Mathieua galanthoides* Klotzsch, in Otto & Dietr., Allg. Gartenz. 21: 337-338. 1853 (Oct. 22).

Urceolina castelnaeana (Baill.) Traub, *comb. nov.* Syn.—*Calliphruria castelnaeana* Baill., in Bull. Soc. Linn. Paris, 143: 1135. 1894 (Mar. 7).

Urceolina korsakoffii (Traub) Traub, *comb. nov.* Syn.—*Eucharis korsakoffii* Traub, Plant Life 23: 85—87. 1967.

Urceolina narcissiflora (Huber) Traub, *comb. nov.* Syn.—*Eucharis narcissiflora* Huber in Bol. Mus. Para. 4: 543. 1906.

Urceolina ulei (Kraenzlin) Traub, *comb. nov.* Syn.—*Eucharis ulei* Kraenzlin, in Engl., Bot. Jahrb. 50: Beibl. 111, pp. 4—5. 1913.

Rauhia Traub.—It is to be noted that the General Committee on botanical nomenclature (Taxon 19: 304. 1970) voted that *Rauhia* Traub (1957, *Amaryllidaceae*) and *Rauia* Nees et Martius (1823, *Rutaceae*) should not be treated as variants under Art. 75 of the Code.

REGISTRATION OF NEW AMARYLLID CLONES

MR. W. D. MORTON, JR., *Emeritus Registrar*

MR. JAMES E. MAHAN, *Registrar*

MR. CHARLES HARDMAN, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62. 1960; Addendum, PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1970

Registered by Sterling S. Harshbarger, 161 S. Virginia Av., Pasadena, Calif. 91107:

"Cousin Gladys" (Harshb., 1971), R; A-915; D-5b; U—4-fld; 22″ high; 6—6½″ diam.; pure white, creped, fringed segs with red ring deep in the apple green throat; deciduous; spring.

Registered by W. Quinn Buck, 26 E. Camino Real, Arcadia, Calif. 91006:

"Stephanie" (Buck, 1971), R; A-916; D-5a; 24″ high; U—4-fld; 8″ diam.; bright pink-scarlet self; very heavy substance; very flat, prominent ears.

Registered by Ed Pencall, 4227 N. Peck Rd., El Monte, Calif. 91732:

"Foxy Pink" (Pencall, 1971), R; A-917; D-5a; 20″ high; U—4-fld; 6″ diam.; medium silvery pink with white blaze on segs; very round.

"Binky Pink" (Pencall, 1971), R; A-918; D-5a; 24″ high; U—3-4-fld; 9″ diam.; rose pink; **award: P. C., 1970,** Off. Amaryllis Show, So. Calif., Hemerocallis & Amaryllis So., Apr. 26, 1970.

RAVENNA—NEW MILLA SPECIES—continued from page 90.

and no doubt exists in my mind about the distinctness of the present species.

A bulb of *Milla oaxacana* still survives in my collection of living plants. Since 1963, when it was planted, it flowered only once.

LITERATURE CITED

Baker, J. G. A revision of the genera and species of herbaceous capsular gamophyllous Liliaceae, Journ. Linn. Soc. Lond. 11: 378-387. 1871.

Moore, H. E. The genus *Milla* and its allies. Gent. Herb. 8: 262-294. 1953.

CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE IV.

Pedro Félix Ravenna
Melián 2240, Buenos Aires, Argentina

The present contributions are a continuation of the series which appeared in PLANT LIFE 1969. The studies presented concern the genera *Amaryllis, Zephyranthes, Chlidanthus, Castellanoa, Stenomesson Griffinia, Tristagma* and *Nothoscordum.* In addition to the Herbaria already enumerated, I have consulted material in the following: Herb. Gunckel, Herb. Looser (both from Chile), LP, SGO, and US. I wish to express my gratitude to the curators or owners, who so kindly made the specimens available to me.

I. STUDIES IN THE GENUS **AMARYLLIS**

My experience in examining different flower shapes in the genus, convinced me that several species might be grouped in *Series*, on phylogenetic grounds. These trends are observables within the various subgenera. Two natural groups are proposed here, in an attempt to fill this need.

Additionally, two undescribed species are included. The first, *A. iguazuana,* was found by Prof. G. Hatschbach in the State of Paraná (Brazil), and by me in the Iguazú National Park in Argentina. The second, *A. rubropicta* is also a native of the same Brazilian State.

STRIATAE Rav. **series nova** (Subgeneris **Lais**)

Perigonium horizontale vel declinatum saepe basin versus valde angustatum (ut in *A. belladonna),* rubrum, scarlatinum, aurantiacum vel luteolum. Tepala saepe undulata tertio inferiore stria media lutescente vel viridescente notata.

Perigone horizontal or declined, often rather narrowed toward the base (as in *A. belladonna),* red, scarlet, orange or yellowish. Tepals frequently undulate with a yellowish or greenish band in the lower third.

Type species: *Amaryllis striata* Lam.

Species hitherto recognized in the Series: *A. striata* Lam., *A. petiolata* Pax, *A. aglaiae* Cast.

AVIFLORAE Rav. **series nova** (Subgeneris **Omphalissa**)

Perigonium horizontale vel saepe oblique erecto-patente modice apertum, rubrum, aurantiacum, albo viridescente vel viride nerviis fusco-rubris vel fusco-aurantiacis saepe profuse notatum. Tepala exteriori-lateralia apicem versus arquata et convergentia sub interiori-inferius contigua.

Perigone horizontal or spreading upright, moderately open, red, orange, greenish-white or green, very often profusely nerved with red or dark orange. Outer pair of inner tepals curved, somewhat convergent toward the apex, contiguous below the lower inner tepal.

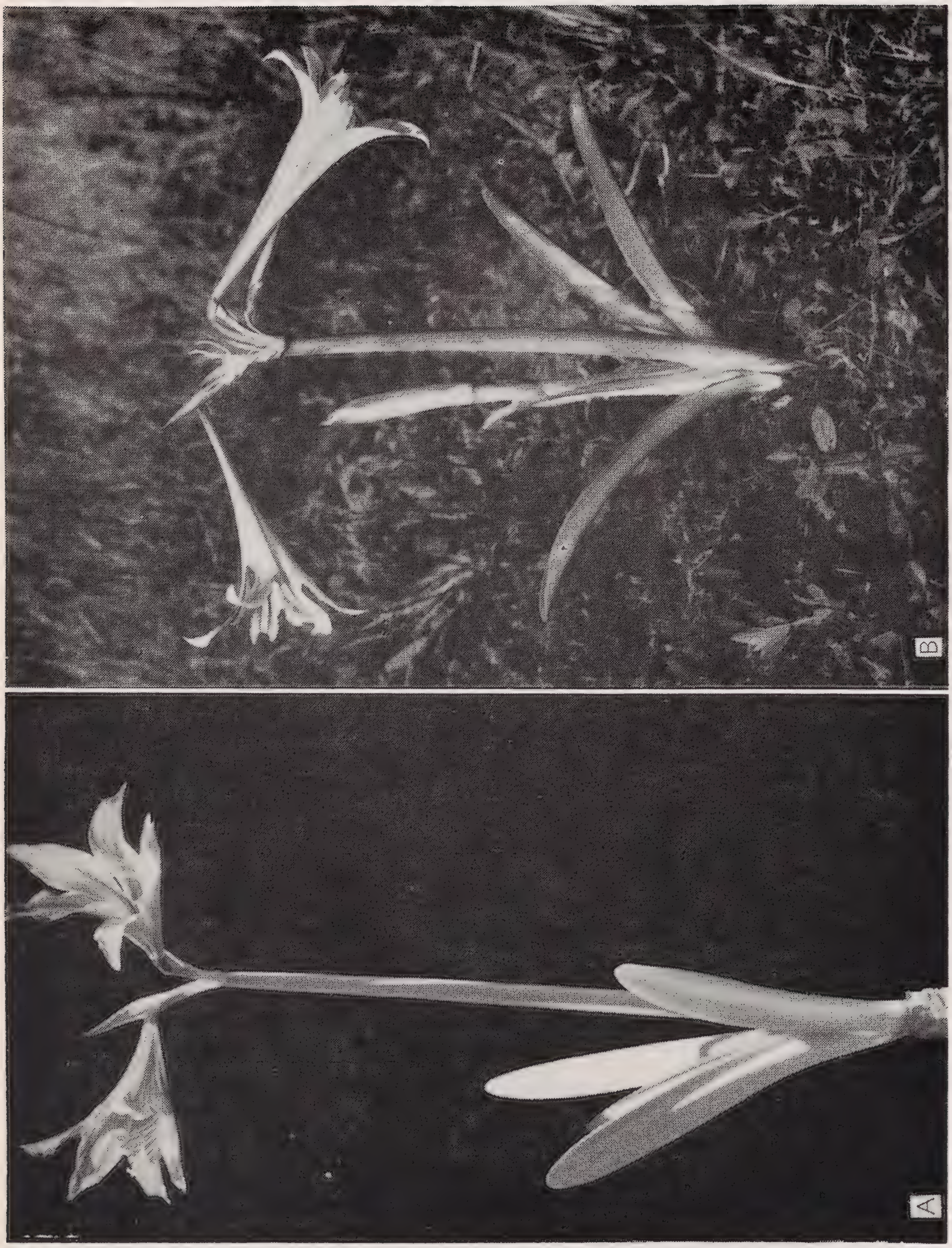

Fig. 20. Left, Amaryllis iguazuana Rav., plant as cultivated in Buenos Aires from bulbs collected in the Iguazu National Park, Argentina. **Right, Amaryllis vittata** L'Herit. ssp. **guarapuavae** Rav., in the wild state. Photos by Pedro F. Ravenna.

Type species: *Amaryllis aviflora* Rav.

Species hitherto recognized in the Series: *A. aviflora* Rav., *A. maracasa* Traub, *A. restingensis* Rav., *A. iguazuana* Rav., *A. rubropicta* Rav., *A. mandoni* (Bak.) Traub et Uphof.

Species of this group are all closely allied and differences are very difficult to detect in herbarium specimens. Important characters as flower color, plant size, and leaves texture, are often not apparent in them.

Amaryllis mandoni (Bak.) Traub et Uphof is transferred to subgenus *Omphalissa* on account of the markedly zygomorphic perigone, which agrees with this Series. The presence of a capitate-trilobed or trifid stigma, is less important than the shape of the perigone, as also occurs in subgenus *Macropodastrum*.

Amaryllis iguazuana Rav. **sp. nov.** (Figs. 20-A & 21)

Planta circ. 64 cm alta. Bulbus late ovatus in collo brevi usque 40 mm longo productus. Folia lorata canaliculata viridia valde pruinosa ad anthesin circ. quinque ad 12-33 cm longa circ. 24-33 mm lata ad apicem subacuta. Scapus usque 45 cm longus leviter compressus pruinosus purpurescens praeter apicem versus cinereo-viridis ad 11.5-12 mm latus ad basin 27-28 mm latus. Spatha usque 8 cm longa; valvae lanceolatae subaequales haud marcescentes pallide virides; bractea interior unica tenuiter filiformis albicans ad 5 cm longa. Pedicelli ad 40-41 mm longi. Inflorescentia biflora. Flores leviter erecto-patentes ad 9.5-10.7 cm longi circ. 10-11 cm in diametro horizontale et 8.8 cm in diametro verticale. Tepala oblanceolata usque 13 mm connata extus praeter margines viridia ad lateras et apicem rubro-venata, intus usque apicem stria media viride caeterum insigniter rubro striata et reticulata; exteriori-superius ad 10.5 cm longum circ. 34 mm latum (apiculus circ. 3 mm longus), exteriori-inferiora arquata sub interiori-inferius contigua valde flexuosa ad 98 mm longa circ. 28 mm lata, interiora-lateralia arquate-patentia ad 95-96 mm longa circ. 24 mm lata, interiori-inferius fasciculo staminum subtendente ad 91 mm longum circ. 15.4 mm latum. Filamenta stricte declinato-ascendentia tertio superiore rubicunda basin versus albicans, sepalina lateralia ad 55 mm longa, sepalinum superius circ. 58 mm longum, petalinum inferius usque 58-60 mm, petalina lateralia ad 77-79 mm longa. Antherae reniformes post dehiscentiam circ. 4.5-5 mm longae; pollen luteus. Stylus declinato-ascendens tertio superiore rubicundus usque 95 mm longus. Stigma trifidus; lobis albis erecto-patentes ad 4 mm longis.

Plant about 64 cm tall. Bulb widely ovoid ca. 6 cm in width; pseudoneck to 4-5 cm long. *Leaves* lorate, channelled, with somewhat revolute margins, green, rather pruinose, often five at anthesis, erect, to 12-33 cm long, 24-33 mm broad, later longer and somewhat recurved, almost pointed. *Scape* to 45 cm high, slightly compressed, markedly pruinose, upwards a grayish-green, purplish below, ca. 11.5-12 mm broad, 27-28 mm near the base. *Spathe* to 8 cm long; *valves* lanceolate, subequal, not marcescent, a pale green; inner bract single, narrowly filiform, whitish, to 5 cm long. *Pedicels* ca. 40-41 mm long. Umbel two-flowered. Flowers spreading obliquely, to 9.5-10.7 cm long, 10-11 cm in its horizontal diameter, 8.8 cm in its vertical diam. *Tepals* oblanceolate, connate at the base for 13 mm, dorsally green excepting the margins and apex which are red-nervated; inner face with a red band throughout, profusely red-striated and reticulated; the upper outer to 10.5 cm long, 34 mm broad, its apiculum ca. 3 mm long; lower outer pair curved, contiguous below the lower inner, rather flexuose, to 9.8 cm long, 28 mm broad; lateral inner pair spreading to 9.5-9.6 mm long, 24 mm broad; lower inner subtending the stamen fascicle, to 9.1 cm long, 15.4 mm broad. *Filaments* closely declinate-ascending, reddish in the upper third, whitish below; upper episepal to 58 mm long, lateral episepal ca. 55 mm long, lower epipetal 55-60 mm long, lateral epipetal pair 77-79 mm long. *Anthers* after dehiscence reniform, ca. 4.5-5 mm long; pollen yellow. *Style* declined-ascending, reddish in the upper third, to 9.5 cm long. *Stigma* trifid, its lobes spreading upright, ca. 4 mm long.

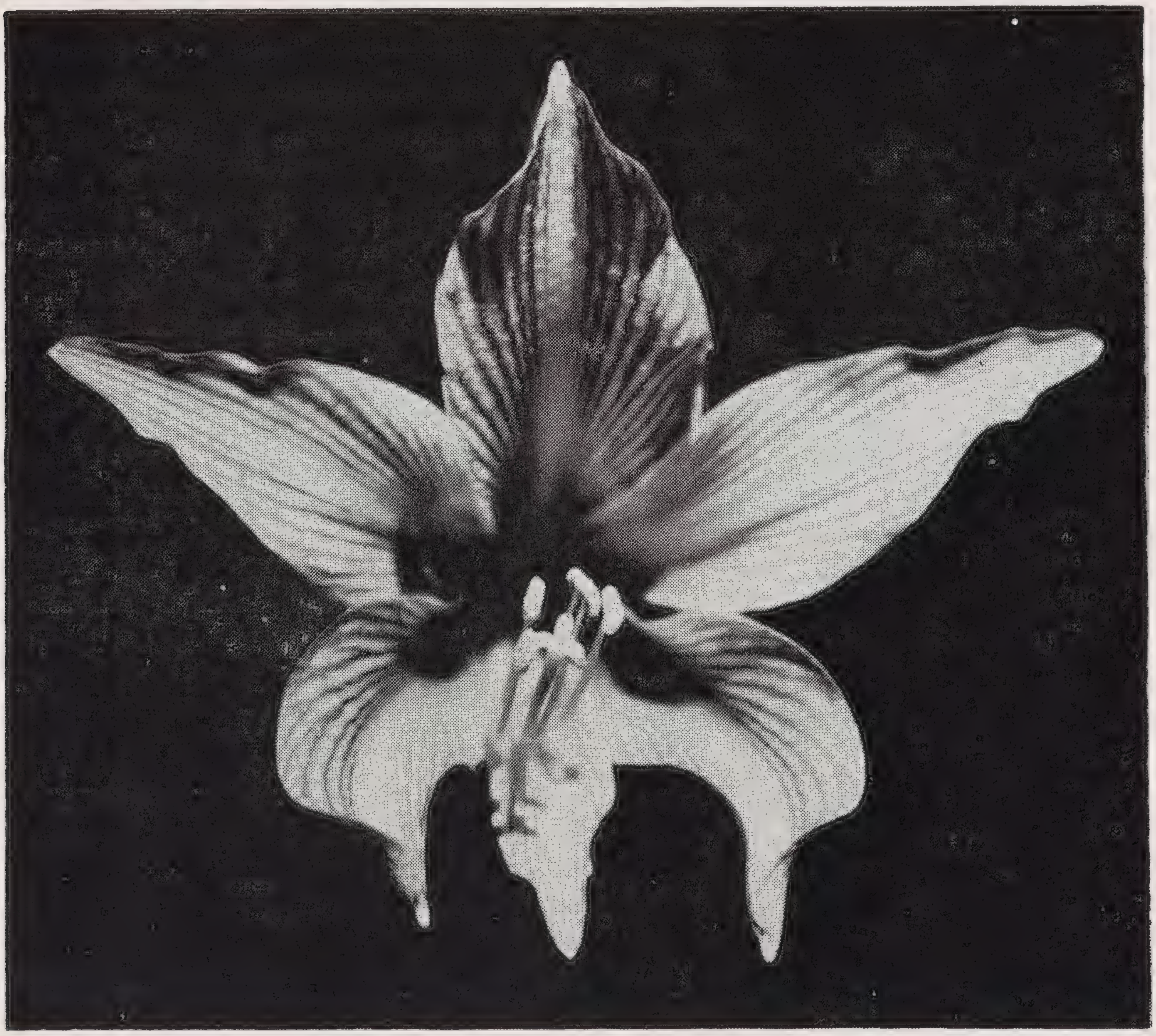

Fig. 21. **Amaryllis iguazuana** Rav., front view of flower. Photo by Pedro F. Ravenna.

Hab.—In clearing of woods, often near streams, at the Iguazú National Park, Argentina. Apparently, it also inhabits some places in the State of Paraná, in Brazil, but in lower drier woods.

Specimens: Culto in Bonaria ex bulbis prope rivulum Central in Parque Nac. Iguazú provincis Missionum Argentinae collectis; leg. Ravenna 1040, II-1970 (typus in Herb. Ravenna). Misiones, dept. of Iguazú, route 101, between Cataratas and Yacuí; leg. Perrone 8-X-1949 (BA 54162). Brazil, Paraná, mun. Guarapuava, Lagoa Sêca; leg. Hatschbach 19784, 21-IX-1968 (HH, Herb. Rav.)?

This interesting species is closely related to *Amaryllis aviflora* Rav., from which it differs by the larger size of the whole plant, and the more undulated and red-tinged tepals.

It seems to be very scarce. A small population was found by me near Arroyo Central, on the way to Cabureí. Some plants are now cultivated at the park-guard's house, near the latter village; others were introduced into cultivation here in Buenos Aires. Apparently the same was collected (dried) by Prof. Hatschbach at Lagoa Sêca, municipe of Guarapuava, in the State of Paraná (Brazil). Bulbs of the latter place were gathered by both of us, and planted in our respective collections.

Amaryllis rubropicta Rav. sp. nov.

Bulbus completus non vidi. Folia ad anthesin circ. quinque crassiuscula lorata ad 26-38 cm longa circ. 10-21.5 mm lata viridia in facie abaxiale pallidiora. Scapus robustus usque 49 cm longus prope basin circ. 17-18 mm latus brunnescens. Inflorescentia biflora. Spathae valvae marcescentes anguste lanceolatae subaequales usque 8 cm longae; bractea interior lanceolato-filiformis membranacea ad 34 mm longa; pedicellis subaequales usque 57 mm longi. Flores erecto-patentes vel suberecti (?) ad 10.6-10.4 cm longi circ. 7-8 cm lati. Tepala usque 7 mm connata viridia praeter margines et apicem versus rubro-tincta et striata, exteriori-superius ad 92 mm longum circ. 37-38 mm latum, exteriora-inferiora usque 93 mm longa circ. 45 mm lata, interiora lateralia ad 83 mm longa circ. 30 mm lata, interiori-inferius ad 8 cm longum circ. 12 mm latus peracutus. Filamentia declinato-ascendentia, sepalina lateralia ad 67 mm longa, sepalinum superius usque 70-72 mm longum, petalinum inferius ad 74-75 mm longum, petalina inferiora circ. 77-80 mm longa. Antherae lutae oblongo-reniformes circ. 5-5.5 mm longae. Ovarium oblongum ad 16-17 mm longum circ. 4.5-5 mm latum. Stylus declinato-ascendens usque 95-98 mm longus. Stigma leviter trifidus, lobis erecto-patentibus interdum inaequalibus ad 1.8-2 mm longis.

Perfect *bulb* not seen. *Leaves* about five *at* anthesis, somewhat fleshy, lorate, to 26-38 cm long, ca. 10-21.5 mm broad, green, abaxial face paler. *Scape* robust to 49 cm long, brownish and 17-18 mm broad toward the base. Inflorescence two-flowered. *Spathe-valves* marcescent, narrowly lanceolate, subequal, to 8 cm long; inner bract lanceolate-filiform, membranous, ca. 34 mm long; *pedicels* subequal to 57 mm long. *Flowers* spreading upright or suberect (?) to 10.6-10.4 cm long, 7-8 cm wide. *Tepals* connate for 7 mm, green excepting margins and apex, which are red-tinged and striate; upper outer to 92 mm long, 37-38 mm broad; lower outer pair about 93 mm long, 45 mm broad; lateral inner pair to 83 mm long, 30 mm broad; upper inner to 8 cm long, 12 mm broad, very acute. *Filaments* declined-ascending; lateral episepal pair to 67 mm long; upper episepal pair about 70-72 mm long, lower epipetal ca. 74-75 mm long; lower epipetal to 77-80 mm long. *Anthers* yellow, oblong-reniform, about 5-5.5 mm long. *Ovary* oblong, ca. 16-17 mm long, 4.5-5 mm in width. Style declined-ascending, to 95-98 mm long. *Stigma* faintly trifid, its lobes ascending, some times unequal, to 1.8-2 mm long.

Hab.—Apparently only from the type-locality, growing under shade.

Specimens: Brazil, Paraná, mun. Río Branco do Sul, Santaría; leg. G. Hatschbach 19683, 10-IX-1968 (type in Herb. Ravenna, isotype HH).

A pretty species closely related to the preceding, but the almost fleshy leaves and the green tepals deeply stained with red at the apex, distinguish it at once. This color pattern could remind one of *Amaryllis psittacina* Ker-Gawl.; though, the latter's flower shape is different.

In the last volume of this Journal, Mr. Harry Blossfeld published the illustration of a flower which he identificates as *A. moreliana.* In my opinion, that plant could be the species here described, rather than the latter. Nevertheless, and in order to clear this point, a pressed specimen or bulbs from Mr. Blossfeld's source, are cordially requested.

Amaryllis vittata L'Her. ssp. **guarapuavae** Rav. **ssp. nov.**

A subspecie vittata flore majore (usque 16-18 cm longus circ. 9-10 cm latus) basin versus tenuiore reccedit.

Differs from subspecies *vittata* on account of its larger flower (ca. 16-18 cm long, 9-10 cm in diam.), narrower toward the base.

Hab.—Undulated fields in the south-western part of the State of Paraná in Brazil; also in the province of Misiones, Argentina. It grows among bushes, apparently the remnants of woody vegetation.

In the second series of these contributions (1969), the range of *A. vittata* was cleared up, assigning it to South Brazil. This conclusion was based on the examination of dry material and photographs of living plants from that region. In the meantime, *Hippeastrum ambiguum* Hook. var. *tweedianum* Herb. was identified with this species. I do maintain this position, on account of the size of the single flower in the type-sheet (at Kew). Nevertheless it appears now that the species is a complex of forms. This can be seen by comparing the photograph of the typical *vittata* (Pl. Life 25, f. 20), with the present illustration of subspecies *guarapuavae.* The latter approaches somewhat to *A. ambigua* Hook., a plant apparently raised by crossing *A. vittata* and *A. solandraeflora* Lindl.

The location where this pretty plant grows, is subject to devastation with fire and other hazards, in order to plant pine trees. No doubt this subspecies will disappear in a short time, at least in that location.

The same was found near Bonpland, in the province of Misiones (Argentina), a long time ago, by P. Joergensen Hansen. The specimen of this collector, cited above, represents the first report of *Amaryllis vittata* in the flora of Argentina. In 1958 I explored the same places, in order to find this and other plants, but was unsuccessful. The environment of that region is at present much modified by man. Nevertheless, it is possible that the plant could be found, in the future, in some other place in the province.

II. **ZEPHYRANTHES** NOTES

A new subgenus, additional, synonyms for *Zephyranthes boliviensis* Bak., and an undescribed subspecies in *Z. minima* are included. Genus *Haylockia* is recognized as a subgenus of *Zephyranthes,* as was previously maintained by Traub (1951).

Genus **Zephyranthes** subgenus **Argyropsis** Herb. ex. Rav., **subgen. nov.**

Herb. Amaryll. 176, 177. 1837.

A subgeneri *Zephyranthes, Pyrolirion* et *Haylockia* stigmate capitato-trilobato foliis saepe valde succulentis, subgeneri *Cooperia* tubo perigonii nullo vel subnullo differt. Typus speciei: *Z. candida* (Lindl.) Herb.

It differs from subgenera *Zephyranthes, Pyrolirion* and *Haylockia,* on account of its capitate-trilobed stigma and often rather succulent leaves; from *Cooperia* it is also separated by its obsolete perigone-tube. Type—species: *Z. candida* (Lindl.) Herb.

Four species from eastern and north-eastern Argentina, Uruguay, Paraguay, and southern Brazil.

1a. Flowers yellow ....1. *Z. flavissima*
1b. Flowers white, pink or purple-tinged with age.
  2a. Style curved, ascending.
    3a. Leaves almost filiform, 1 mm or less broad. Flower ca. 17-26 mm in diam. Plants weak, with a resting period ....2. *Z. stellaris*
    3b. Leaves not filiform, ca. 3-5 mm broad. Flowers about 30-50 mm in diam. Plants not weak, evergreen, inhabiting damp or inundated places ....3. *Z. candida*
  2b. Style straight, erect.
    4a. Fertile stamens 3, and 3 staminodes ....4. *Z. minima* ssp. *minima*
    4b. Fertile stamens 6 ....4b. *Z. minima* ssp. *hexandra*

The name *Argyropsis,* was provisionally suggested by Herbert (1837, pp. 176, 177), if it could be proved that *Zephyranthes candida* represents the type of a separate genus. He said: ''My belief is that this plant belongs to a genus intermediate between Zephyranthes and Cooperia, though I will not disturb it till the further species of those genera can be thoroughly examined''. *Cooperia* Herb. was integrated as a subgenus of *Zephyranthes* (see Pl. Life 7: 43).

To my hand, I am convinced that the four species above enumerated, represent a natural group of subgeneric rank within *Zephyranthes. Z. stellaris* Rav., and *Z. flavissima* Rav., recently described (1967), both give strength to this position. The latter is sometimes subaquatic in Argentina, even if it also inhabits the highlands of Southern Brazil; it shows considerable resemblance, in habit, with *Z. candida.*

Stigma shape and the lack of perigone tube are the main characters which separates *Argyropsis* from the rest of subgenera.

Zephyranthes minima Herb. **ssp. hexandra** Rav., **ssp. nov.**

A subspecie minima planta in omne parte majora staminibus antheris sex polleniferis instructibus.

Hab.—in campis provinciae Entre Rios Argentinae. Crescit prope subspeciem typicam, *Marsillea concinna* Bak., *Habranthus tubispathus* ssp. *macranthus* Rav. *Alophia lahue* (Mol.) Espin. ssp. *amoena* (Gris.) Rav. et caet.

Specimens: Argentina: prov. Entre Ríos, Concepción del Uruguay, cerca del puerto; leg. Ravenna 628, IV-1967 (type in Herb. Ravenna).—Idem, dept. C. del Uruguay, Campichuelo, orillas río Uruguay; leg. Burkart et Troncoso 24141, 10-IV-1963 (SI). Idem, Banco Pelay; leg. ipses 24142, 11-IV-1963 (SI).

The plant is similar to the type, but larger in all its parts; it has six fertile stamens instead of three as in subspecies *minima.* It is frequently found near the latter. The barriers which obstruct hybridation between both subspecies, are at present unknown.

Zephyranthes boliviensis, Bak.

Baker, Handb. Amaryll.: 38. 1888.; *Zephyranthes xyphopetala* Baker, Mem. Torr. Bot. Club 4: 268. 1896.; *Z. viridilutea* Kraenzlin, Fedde Rep. 13: 118. 1914.; *Pyrolirion boliviense* (Bak.) Sealy, Journ. Roy. Hort. Soc. 62: 207. 1937.; *P. xyphopetalum* (Bak.) Sealy, loc. cit.: 208.; *Habranthus viridiluteus* (Kraenzl.) Traub, Pl. Life 7: 42. 1951.

Bulb ovoid or subglobose ca. 41-44 mm long, 27-39 mm in width, produced into a short pseudo-neck. *Scape* cylindrical to 8.7-32 cm long. Spathe membranous, lanceolate, about 25-30 mm long, tubular for 10-14 mm, then entire upwards. *Flower* erect, sessile, yellow, about 26-50 mm long, 30-44 mm in diam. *Ovary* almost cylindrical, ca. 7-11 mm long, 1.5-2.2 mm wide. *Tepals* oblanceolate, subequal, connated at the base for 5-10 mm, about 27-42 mm long, 5-8 mm broad. *Filaments* filiform, somewhat curved, biseriate, episepals ones ca. 6-9 mm long, epipetal to 9-10 mm long. *Anthers* linear oblong, to 6 mm long, after dehiscence markedly circinate. Style erect, ca. 20-29 mm long, trifid at the apex; *style* branches about 6-11 mm long, the stigmatic portion clavate-emarginate or spathulate.

Hab.: Bolivian plateau and northern adjacent valleys, about 2700-

3500 m over the sea level. In the Sorata valley is found in slippery grades of schist stones, above the river Challasuyo, growing near *Chlidanthus soratensis* (Bak.) Rav., and *Cypella peruviana* (Bak.) Bak. ssp. *soratensis* Rav. A plant which I have seen between Cochabamba and Challa (on the way to Oruro), seems to be the same.

Specimens: Bolivia, Dept. La Paz, prov. Larecaja, viciniis Sorata, inter Hunaypata et rivum Challasuyo; leg. Mandon 1194 pp. IX-X-1858 (phototype from K, neg. 11515).; Idem, Bolivian plateau; leg. Bang 890, 1891 (NY, type of *Zephyranthes xyphopetala* Bak.).; Idem, in der Felsheide bei Teneria, in 3000 m ü d. M; leg. Herzog 2486 (B, type of *Zephyranthes viridilutea* Kraenzl.).

A time ago, I requested on loan the type-specimens of *Zephyranthes xyphopetala* Bak. and *Z. viridilutea* Kraenzl. After an accurate examination, it was possible to ascertain that the latter was identical to the former. A photograph from the type of *Z. boliviensis* Bak., lately received from Kew Gardens, revealed that this is the earlier name for the species.

Z. viridilutea Kraenzl. was transferred by Traub (1951, p. 42) to *Habranthus;* but, according to the characters given in the description above, that position seems untenable to me.

The species is now placed in subgenus *Pyrolirion*, but the markedly biseriate stamens with circinate anthers are in disagreement with this, statement. Moreover, the deeply trifid stigma (which I consider as true style arms), seems to be an unusual feature. It is probable that the species should deserve a special placement in a new subgenus. Nevertheless, I prefer not to erect it for the present.

Genus **Zephyranthes** subgenus **Haylockia** (Herb.) Traub

Traub, Pl. Life 7: 43. 1951.—Genus *Haylockia* Herbert, Bot. Reg. 16: tab. 1371. 1830.

Haylockia Herb. was reduced to a subgenus of *Zephyranthes* by Traub (1951). His viewpoint, in my opinion, was correct. Whereas, several years later (1963), he apparently changed his mind. Thus, it is necessary to review its characters, comparing them with the recognized subgenera of *Zephyranthes (Cooperia, Zephyranthes* and *Argyropsis):*

1) The type-species, *Haylockia pusilla* Herb., has sessile flowers with a long perigone tube, the same as *Cooperia.* 2) Stamens are bibiseriate with arquate moderately produced (long) filaments, as in several species of *Zephyranthes.* 3) The style, although very long (most of its length is included in the perigone tube), does not reach the anthers; sometimes only a short part of its arises from the tube. Almost the same feature is found in *Cooperia,* but in this subgenus the stigma is capitate-trilobed, and the tepals are much spreading. 4) In subgenus *Argyropsis*, although the tepals are connate for 1-3 mm, there is no tube; the stigma is capitate-trilobed. 5) The scape is included in the pseudo-neck of the bulb at anthesis (it arises with fructification); this appears to be the only exclusive character in subgenus *Haylockia.*

In other words, *Haylockia* is an intermediate between subgenera *Zephyranthes* and *Cooperia,* within the genus *Zephyranthes.*

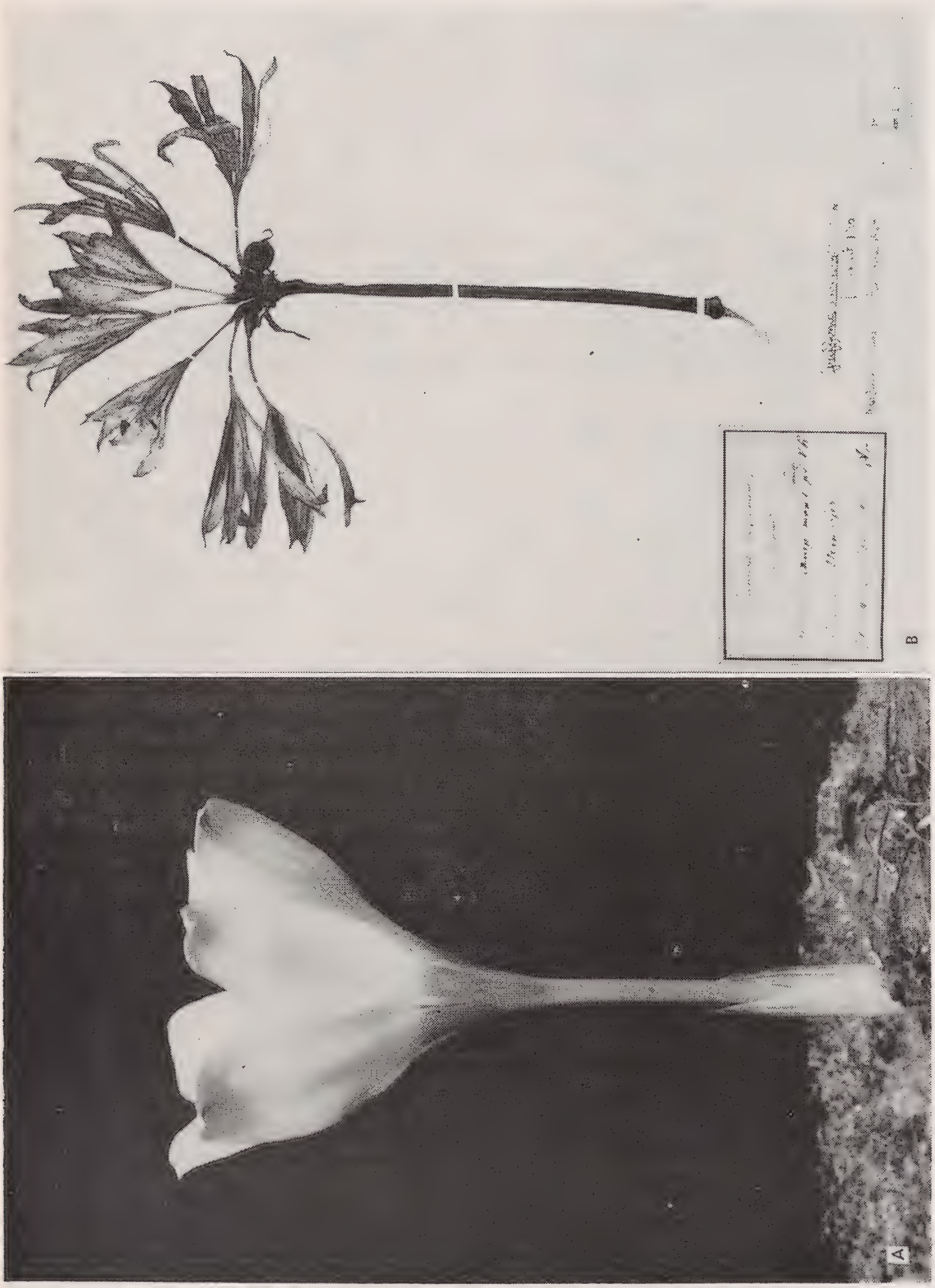

Fig. 22. **Left, Zyphranthes pusilla** (Herb.) Dietr., as cultivated in Buenos Aires, from bulbs collected at La Paloma, Uruguay. **Right,** the type specimen of **Griffinia concinna** (Mart. ex Schult.) Rav., in the Muenchen Museum (M).

Zephyranthes pusilla (Herb.) Dietr. (Fig 22-A)

Dietrich, Syn. Pl. 2: 1176. 1840.; *Haylockia pusilla* Herbert, Bot. Reg. 16: tab. 1371. 1830.

Plant ca. 45-65 mm tall. *Bulb* almost globose, to 18-20 mm in diam., covered by brown coats and produced into a pseudo-neck for 4-8 cm. *Leaves* absent at anthesis, serotine, produced in autumn, linear, channelled, rosulate, a dark green, about 7-15 cm long, 1-2.2 mm broad. *Scape* subterranean when in flower, included in the pseudoneck, to 3-5 cm long when in fruit, ca. 2-2.5 mm broad, compressed, a brownish green. *Spathe* often subterranean or appearing from the soil for half of its length, to 25-35 mm long, very thin, hyaline, compressed, bifid at the apex for 6-8 mm, sometimes with brownish veins. *Ovary* oblong, whitish, ca. 3.8 mm long, 2.5 mm broad, sessile. *Perigone-tube* to 36-42 mm long. *Tepals* oblanceolate, connate above the tube for 3.5-4.5 mm; the outer about 20-30 mm long, 4.8-7 mm broad, shortly apiculate, with diminutive streaks near the base; the inner ca. 7-11.6 mm broad, without streaks near the base. *Filaments* lanceolate-filiform, upright; episepal about 6-10 mm long, connated to its tepal for 3.5 mm; epipetal ca. 11-14 mm long, connated to its tepal for 3.7-3.8 mm. *Anthers* orange-yellow, semilunate or very often twisted, ca. 2-4.7 mm long. *Style* reaching the length of stamens or not, often concealed by the perigone-tube, to 38-45 mm long; *Stigma* trifid, its divisions recurved ca. 3.5-3.8 mm long. Capsule rounded, compressed, ca. 6 mm in diam. Seeds compressed but not with papyraceous edges, semilunate or almost deltoid, black, to 2.4-2.5 mm.

Hab.—Dry fields or hills of Southern Brazil (Río Grande do Sul), Uruguay and the Argentine provinces of Entre Ríos and Corrientes. Cultivated in my collection, from bulbs collected near Mercedes, in the prov. of Corrientes, and at La Paloma, in the Republic of Uruguay.

Specimens: Argentina: Entre Ríos, Concepción del Uruguay; leg. Lorentz 728 (BAF). Corrientes, Tapebicua; leg. Martinez Crovetto & Leguizamón 5524 (BAB) fl. yellow. Idem ibid.; leg. ipses 5523 (BAB), fl. white. Idem, Mercedes; leg. R. A. Spegazzini, 23/31-III-1940 (BAB 60824).

Brazil: Río Grande do Sul, Porto Alegre, Montserrat, in campo; leg. K. Emrich, 17-II-1942 (PACA 10176). Idem ibid., campo pedregoso; leg. ipse (PACA 11505). Idem ibid, campo pedregoso; leg. ipse, 25-I-1943 (PACA 30008). Idem ibid; leg. ipse (PACA 25009).

Uruguay: Dept. Tacuarembó, Rincón de la Laguna; leg. Castellanos, 15-II-1947 (BA 55397). Idem, Villa La Paz, arroyo Rosario; leg. Doello Jurado, 18-II-1920 (BA 16746).

Zephyranthes pusilla (Herb.) Dietr., was recorded in the flora of Buenos Aires by Kunth (1850, p. 480), Baker (1888, p. 30) and Holmberg (1903, p. 119). Hicken (1910, p. 70) follows these authors, but he remarks: ''no hallada aún'' (not found yet). Kunth's and Baker's citations are based on specimens from Sello's collection labelled ''Buenos Aires''. Most of the sheets of this collector were ambiguously annotated, apparently after his death, as ''Brasilia meridionalis'', ''Montevideo'', and so.

It must be said that there is no specimen in any Herbarium here, to confirm those assertions, and nobody has seen the species in any place of the province of Buenos Aires. Nevertheless, some sheets from Entre Ríos and Corrientes truly proved the existence of it in Argentina.

III. STUDIES IN THE GENUS **CHLIDANTHUS**

Rhodophiala soratensis (Bak.) Traub (*Hippeastrum soratense* Bak.) is transferred to the genus *Chlidanthus.*

Chlidanthus soratensis (Bak.) Rav. **comb. nov.**

Hippeastrum soratensis Baker, Handb. Amarll.: 42. 1888.; *Amaryllis soratensis* (Bak.) Traub & Uphof, Herbertia 5: 123. 1938.; *Rhodophiala soratensis* (Bak.) Traub, Pl. Life 9: 60. 1953.

A comparison of the description of *Rhodophiala soratensis* (Bak.) Traub, with the current characters in the genus, showed considerable discrepancy. In fact, the existence of a long, slender, perigone-tube, (to 45-50 mm long) was an unusual feature. For this reason, I asked for a photograph of the type specimen, which is deposited at Kew.

The type-sheet, as shown by the photograph, represents a single plant, about 12 cm tall, with a two-flowered inflorescence. The long-tubed flowers are erect, and supported by distinct pedicels (ca. 17-21 mm long). Stamens appear to be short and upright. These characters suggest a *Chlidanthus,* not a *Rhodophiala;* therefore, the species is transferred to the former genus.

Baker says that the bulb is ''under an inch in diam.'', but it seems to me that he missed it with the pseudo-neck, which was apparently cut above the bulb in digging.

The recogniton of this species as a *Chlidanthus,* makes more natural and clear the distribution area of *Rhodophiala.*

Specimens: Bolivia, dept. La Paz, prov. Larecaja, inter Hunaypata et rivum Challasuyo, 2700 m; leg. Mandon 1194 pp., 8-IX-1858, removed from the type-sheet of *Zephyranthes boliviensis* Bak. phototype from K, neg. 10889).

IV. A SECOND SPECIES IN THE GENUS **CASTELLANOA**

In 1967, Dr. D. Werner, of Hamburg, brought a collection of plants from the plateau of northern Argentina. Some specimens and bulbs were presented to me for study. A single sheet of the *Amaryllidaceae,* was deposited in the herbarium of the La Plata Museum (LP). After an accurate examination, this proved to be a second species of *Castellanoa.*

Castellanoa yaviensis Rav. **sp. nov.**

A *Castellanoa marginata* parti alati filamentorum breviori ad apicem dentis duobus lateralibus differt.

Plant about 40-45 cm tall. *Bulb* large, broadly ovoid, ca. 7 cm in diam. produced for 10-14 cm into a pseudo-neck. *Leaves* linear distinctly channeled, ash-green, pruinose, to 30-40 cm long, 8 mm broad, obtuse, with minutely denticulate-papilose, somewhat scabrous margins. *Scape* compressed ca. 40 cm long. *Spathe* ca. 5-10-flowered; valves membranous, rufescent, subequal, narrowly lanceolate, to 75-82 mm long; inner bracts as much as flowers, linear, subfiliform, about 4-5 cm long. *Pedicels* ca. 5-8 cm long. *Flowers* horizontal or declined, pink-orange, to 40-55 mm long, 18-21 mm in diam. *Ovary* oblong or narrowly elliptic, obtusely trigonous, ca. 5 mm long, 2.5 mm broad. *Perigone-tube* slightly curved, ca. 36-38 mm long, somewhat ampliated toward the apex. *Tepals* oblanceolate, subequal, ca. 14-17 mm long, 5-6.5 mm broad, the outer apiculate; apiculum ca. 1.5-2 mm long, with a callus velvety-penicilled at its base. *Stamens* biseriate. *Filaments* flattened and winged below; winged portion rather adnate with the tepals, ca. 1.2-1.4 mm broad in its upper part, ending in two lateral, slightly curved, ca 0.4 mm long, teeth; their base connected by a thin membrane; epipetal filaments 10.7 mm long, its winged portion 4 mm long, adnated for 1.7 mm, upper filiform part about 6.5 mm long. *Anthers* elliptic, yellow, to 5 mm long before dehiscence, afterwards reduced to 3.4 mm. *Style* ca. 37-44 mm long; *stigma* trifid, its divisions spreading, about 1.5-1.9 mm long.

Specimens: Argentina, Jujuy, dept. of Yaví, downward ravine from Yaví to Bolivia, 3380 m of altitude; leg. D. Werner 877, 25-X-1967 (type LP).

The presence of a pair of teeth on each filament, might be considered as unusual. However, we should remember the variations in the staminal cup of *Stenomesson. S. aurantiacum* for instance, has no teeth (see fig. 25), in contrast with most of the species in the genus. The new species is, in other respects, similar to *Castellanoa marginata* (Fries) Traub.

A bulb of *Castellanoa yaviensis* is cultivated in my collection from Dr. Werner's source, but never flowered. Characters of bulb and leaves were taken from this plant.

V. STUDIES IN THE GENUS **STENOMESSON**

During a long collecting trip to the Andes, bulbs of several *Stenomesson* species were gathered and introduced into cultivation. Some of them flowered here; this material permitted the preparation of descriptions and photographs.

From the first moment, identification of the plants appeared difficult. Apparently, problems of misinterpretations of species, originating in the last century, were still unsolved. In the following lines, I attempt to treat this subject. Moreover, four new species and a number of new combinations are proposed.

Stenomesson glareosum Rav. **sp. nov.** (Fig. 23)

Planta circ. 14 cm alta vel minor. Bulbus subovatus ad 30 mm longus circ. 24 mm latum in collo plus minusve longus productus. Folia unica vel dua aestivalia oblanceolato-petiolata fusco-viridia prefoliationis revolutis ad 10-15 cm longa circ. 30-35 mm lata. Scapus subteres gracilis

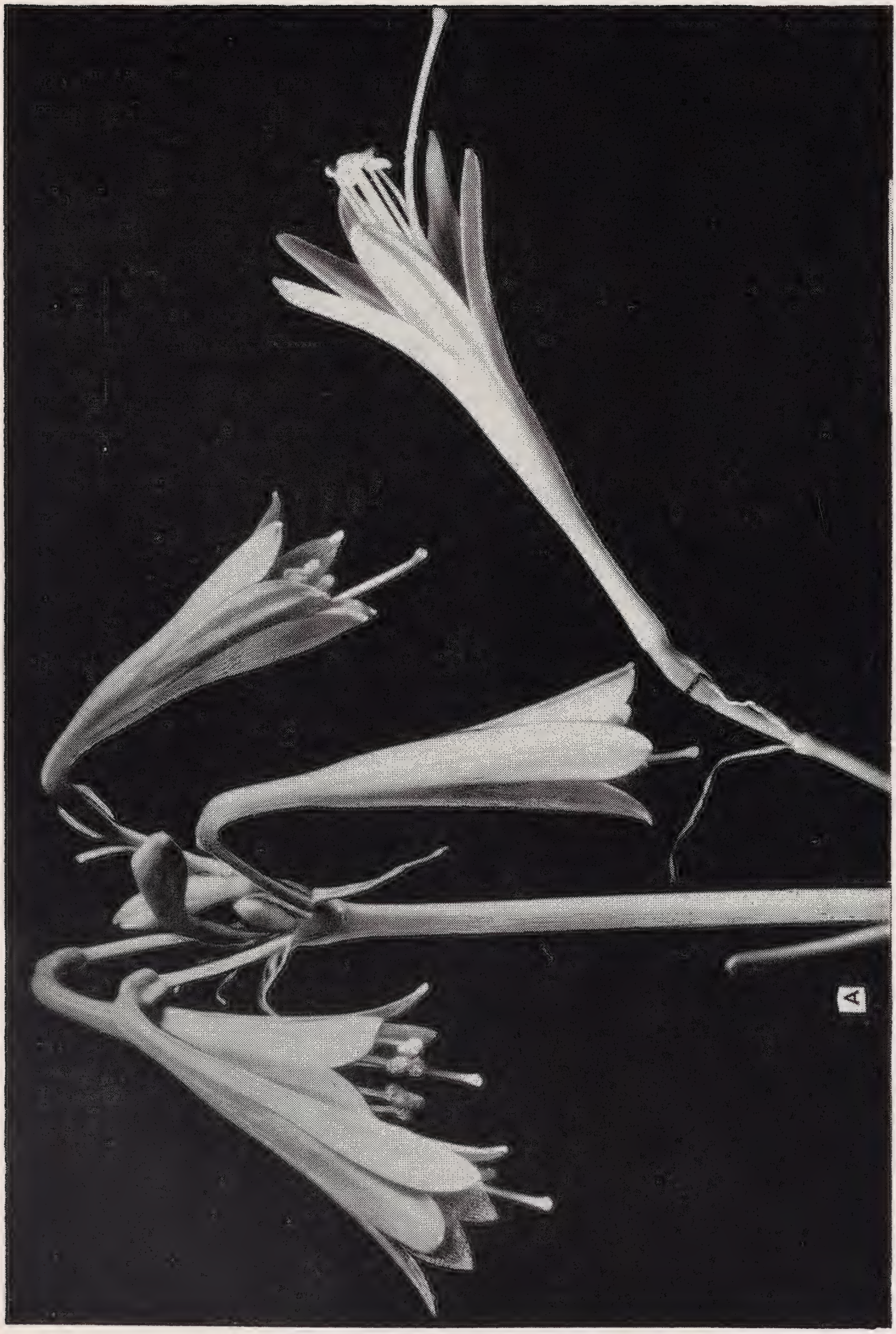

Fig. 23. **Left, Stenomesson flammidum** Rav., inflorescence, as cultivated in Buenos Aires. **Right, Stenomesson glareosum** Rav., as flowered in Buenos Aires, from bulbs collected at Churín, Dept. of Lima, Peru. Photos by Pedro F. Ravenna.

ad 5-8 cm longus pallide viridis. Spatha bivalvata saepe uniflora raro biflora et rarissime triflora; valvae ad anthesin siccae usque 3 cm longae angustissime lanceolatae. Flos cernuus vel horizontalis viridescens usque 50 mm longus circ. 20 mm latus. Pedicellus usque 30 mm longus. Perigonii tubus versus circ. 13.2 mm longus circ. 2.2 mm latus ad basin leviter ampliatus, deinde tepala usque 18 mm concrescentia; pars libera lanceolata erecto-patentia, exteriora ad 18 mm longa, interiora circ. 19 mm longa. Corona angusta submembranacea viridescens irregulariter dentata circ. 7.5 mm longa; dentis integris vel raro crenulatis ad 1.5-3 mm longis. Filamenta filiformia usque 12 mm longa. Antherae versatiles reniformes circ. 2.6 mm longae. Stylus filiformis ad 6.7 cm longus; stigma capitato-trilobatus.

Plant about 14 cm high or smaller. *Bulb* almost ovoid to 30 mm long, 24 mm in width, produced into a somewhat long pseudo-neck. *Leaves* two or single, produced in summer, oblanceolate, petioled, a dark green, vernation revolute, to 10-15 cm long, 30-35 mm broad. *Scape* almost cylindrical, weak, to 5-8 cm long, a pale green. *Spathe* bivalved, often one-flowered, rarely two-flowered or three-flowered; valves dry at anthesis, to 3 cm long, very narrowly lanceolate. *Flower* cernuus or horizontal, greenish, to 50 mm long, 20 mm in diameter. Pedicels to 30 mm long. *Perigone-tube* about 13.2 mm long, 2.2 mm wide, slightly ampliated at the base, then *tepals* concrescent for 18 mm; free portion lanceolate, spreading upwards; the outer series to 18 mm long, inner about 19 mm long. *Staminal cup* narrow, membranous, greenish, irregularly dentate, about 7.5 mm long; teeth entire or rarely crenulate, about 3 mm long. *Filaments* filiform about 12 mm long. *Anthers* versatile, reniform, about 2.6 mm long. *Style* filiform, to 6.7 cm long; *stigma* capitate-trilobed.

Hab.—Stony slopes above Churín, in the dept. of Lima, Perú.

Specimens: Culta in Bonaria ex bulbis in glareosis supra Churín Limae Peruviae collectis; leg. Ravenna 288, IX-1960 (typus in Herb. Ravennae).

This greenish flowered species is the only one so-colored in the subgenus *Stenomesson.* It can be easily separated from the rest of the species on account of the very narrow irregularly dentate staminal cup. It appears somehow mimetic, among stones, on the nearly desert slopes above Churín, in the dept. of Lima, Perú.

It flowered in my collection, but the bulbs were lost after a few years.

Stenomesson campodense Rav. **sp. nov.**

Planta circ. 20-32 cm alta. Bulbus ovatus ad 3.4 cm longus circ. 2.8 cm latus in collo distincto productus. Folia ad anthesin nulla, post anthesin linearia crassiuscula canalículata laxa viridia haud pruinosa ad 15-18 cm longa circ. 7 mm lata ad apicem subobtusa. Scapus subteres ad 20-32 cm longus circ. 5 mm latus. Spatha bivalvata usque 8-flora valvis sublanceolatis marcescentes circ. 34 mm longis et bracteis interioribus linearis multis instructa. Flores penduli rosei pedicellati. Ovarium oblongum ad 3.9 mm longum circ. 1.9 mm latum. Perigonii tubus circ. 8-10 mm longus curvatus. Tepala usque 5-6 mm concrescentia oblongo-lanceolata ad apicem viridi-suffusa, exteriora ad 19-21.3 mm longa circ. 2.5 mm lata apiculata, interiora ad 18-20 mm longa circ. 3-3.5 mm lata. Corona grandis ad 15.5-18 mm longa circ. 7.5-8.5 mm lata dentibus cocleariformibus leviter bifidis circ. 3.7 mm longis instructa. Filamenta sepalina ad 3.7-5.8 mm longa, petalina leviter minora. Antherae oblongae circ. 2.4-2.5 mm longae versatiles; pollen loculique lutei. Stylus circ. 3 cm longus; stigma capitato-clavatus.

Plant about 20-32 cm tall. *Bulb* ovoid to 3.4 cm long, 2.8 cm wide, produced into a distinct pseudo-neck. *Leaves* none at anthesis, linear, somewhat fleshy, canaliculate, lax, green, not pruinose, to 15-18 cm long, 7 mm broad, almost obtuse. *Scape* almost cylindrical, to 20-32 cm long, 5 mm wide. *Spathe* bivalved 8-flowered; valves almost lanceolate marcescent, about 34 mm long; inner bracts several, linear. *Flowers* nodding, pink, pedicellate. *Ovary* oblong to 3.9 mm long, 1.9 mm wide. *Perigone-tube* about 8-10 mm long, curved. Tepals concrescent for 5-6 mm, oblong-lanceolate, green-tinged at the apex, the outer about 19-21. 3 mm long, 2.5 mm broad, apiculate, the inner to 18-20 mm long, 3-3.5 mm broad. *Staminal cup* large to 15.5-18 mm long, 7.5-8.5 mm in diameter; teeth spoon-shaped, slightly bifid, about 3.7 mm long. *Filaments* episepals to 3.7-5.8 mm long, epipetal slightly shorter. *Anthers* oblong about 2.4-2.5 mm long, versatile; pollen yellow. *Style* about 3 cm long; *stigma* capitate-clavate.

Hab.—Open dry places with sandy soil (with *Bombax* sp.) on the way to the Hacienda Campodén (Casa Grande), circ. 1980 m above sea level, dept. of Cajamarca, Perú. The same species was found also between Membrillar and Llaguén, in the province of Otusco, dept. La Libertad.

Specimens: Perú: Cajamarca, in convalle fluminis Chicama ad viam praedii Campodén circ. 1980 m supra mare; leg. Ravenna 103, VII-1960 (type in Herb. Ravenna). Idem, La Libertad, prov. Otuzco, entre Membrillar y Llaguén; leg. A. López (HUT 1514).

This pretty species has a large staminal cup with concave, spoon-like, teeth. It is nearly related to *S. breviflorum* Herb.; the latter has similar-colored flowers, but a smaller cup with much bifid spreading of teeth, and no green-tipped tepals.

I found it also in the valley near the small town of San Juan, near the city of Cajamarca. It flowered in August 1961 under cultivation in Buenos Aires.

Stenomesson flammidum Rav. **sp. nov.** (Fig. 23)

Planta cir. 15-20 cm alta. Bulbus late ovatus ad 35 mm latus in collo circ 3 cm vel ultra productus, tunicis fusco-ochraceis obtectus. Folia usque quinque serotina linearia crassiuscula subcanaliculata prostrata usque 25 cm longa circ. 5.5 mm lata. Scapus teres ad 26 cm longus circ. 5-6 mm latus. Spatha multiflora, valvis marcescentibus. Flores nutantes pedicellati insigniter rubri ad 42 mm longi circ. 12-13 mm lati. Ovarium anguste aellypticum ad 3.8 mm longum circ. 1.8-2 mm latum obtuse angulatum. Perigonii tubus usque 13 mm longus deinde tepala circ. 12 mm conata; pars libera tepalorum exteriorum ad 17 mm longa circ. 5 mm lata, interiora paullo minora. Corona staminum circ. 5 mm longa inter filamentos dentibus brevis usque 1.2 mm longis ultra medium bifidis patentibus instructa. Filamenta filiformia petalos subaequantia vel brevia. Stylus usque 47 mm longus; stigma capitatus.

Plant to 15-20 cm tall. *Bulb* widely ovoid about 35 mm in width, produced into a pseudo-neck for 3 cm or further; outer coats of a dark brown. *Leaves* about five, serotine, linear rather fleshy, almost canaliculate, prostrate, to 25 cm long, 5.5 mm broad. *Scape* cylindrical about 26 cm long, 5-6 mm wide. *Spathe* several-flowered; valves marcescent. Flowers nodding, pedicellate, of a bright red, to 42 mm long, 12-13 mm in diameter. *Ovary* narrowly elliptic about 3.8 mm long, 1.8-2 mm wide, obtusely trigonous. *Perigone-tube* to 13 mm long. *Tepals* concrescent for 12 mm, then about 17 mm long, 5 mm broad; inner slightly smaller. *Staminal cup* to 5 mm long; teeth short, to 1.2 mm long, bifid for more than half of their length. *Filaments* filiform, almost equalling the tepals or shorter. *Style* about 47 mm long; *stigma* capitate.

Hab.—Grassy places and mountains of the depts. of La Libertad and Cajamarca, Perú.

Specimens: Cultivated in Buenos Aires from bulbs collected in Perú, at the road cross to Otuzco, dept. La Libertad (province of Otuzco); leg. Ravenna 902, Spring 1961 (type in Herb. Ravenna). Idem, Cerro San Lorenzo, entre rocas y cultivada, 2860 m; leg. N. Angulo, 19-VII-1950 (HUT 1231). Idem, prov. de Bolivar, arriba de Longotea, 3200 m; leg. A. López & A. Sagástegui 27-V-1960 (HUT 3176). Idem, prov. Huamachuco, entre Yanazara y Huaguil (carretera al Maranón); leg. A López & A. Sagástegui 3750, 24-VI-1958 (HUT 2752).

A specimen of this species was apparently examined by Macbride (1936, p. 682), and misidentified as *Stenomesson suspensum* Bak., a synonym of *S. aurantiacum* (H.B.K.) Herb.

Stenomesson flammidum is somewhat allied to *S. breviflorum* Herb. However, our plant has longer and narrower flowers.

Stenomesson mirabile Rav. **sp. nov.** (Subgen. **Callithauma**)

Planta supra solum circ. 40 cm alta. Bulbus oblongo-ovatus ad 9 cm longus circ. 4 cm latus in collo crasso saepe longissimo (usque 35 cm) productus, tunicis brunneis vestitus. Folia ad anthesin nulla serotina lorata viridia haud pruinosa valde carinata ad 30 cm longa circ. 18-20 mm lata ad faciem abaxialem nervio crassiusculo notata ad apicem subacuta. Scapus compresso-ancipitus ad 30-35 cm longus. Spatha complanata bivalvata quadriflora; valvae obtusae saepe persistentes paullo inaequales, inferior ad 7 cm longa circ. 2.4 cm lata, superior ad 6 cm longa circ. 2 cm lata; bracteae interiores tres lanceolatae. Flores horizontales brevissime pedicellati extus bicolores textura crassa. Pedicelli usque 3 mm longi. Ovarium oblongum ad 7-10 mm longum circ. 5 mm latum fusco viride. Perigonii tubus et pars cnncrescens tepalorum inter se edistincti, totum fusco viride circ. 40-60 mm longum superne circ. 6 mm latum. Tepala (pars libera) contigua in urceola conniventia oblongo-aellyptica rubra, exteriora ad 20.4 mm longa circ. 11 mm lata ad apicem pennicillato-apiculata, interiora ad 18 mm longa circ, 12.4 latum fusco viride. Perigonii tubus et pars concrescens tepalorum inter ad apicem pennicillato-apiculata, interiora ad 18 mm longa circ. 12.4 mm lata ad apicem obtusa velutina. Corona staminum integra crassiuscula alba obtuse lobata. Filamenta usque 2 mm infra marginem corona inserta filiformia erecta, sepalina ad 95 mm longa, petalina circ. 8 mm longa. Antherae oblongae rectae ad 5.3-5.5 mm longae; pollen subfusiformis. Capsula tricocco-globosa. Semina semicircularis nigra complanata ad margines papyracea.

Plant to 40 cm tall above the soil. *Bulb* oblong-ovate, about 9 cm long, 4 cm wide, produced into a thick, often very long (to 35 cm) pseudoneck; outer tunics of a blackish brown. *Leaves* none at anthesis, serotine, lorate, green, not pruinose, rather carinate, to 30 cm long, 18-20 mm broad, with a thickened midrib on the abaxial face, subacute. *Scape* compressed, ancipitaed, to 30-35 cm long. *Spathe* compressed, bivalved, 4-flowered; valves obtuse, often persistent, somewhat unequal, the lower to 7 cm long, 2.4 cm broad, upper about 6 cm long, 2 cm broad; inner bracts three, lanceolate. Flowers horizontal very shortly pedicellate, externally of two colors, of a thick texture. *Pedicels* to 3 mm long. *Ovary* oblong, to 7-10 mm long, 5 mm wide, a dark green. *Perigone-tube* and concrescent part of tepals not differentiated, a dark green, about 40-60 mm long, to 6 mm wide in the upper part. *Tepals* contiguous, forming a cup, oblong-elliptic, red; the outer about 20.4 mm long, 11 mm broad, penicilate-apiculate; the inner to 18 mm long, 12.4 mm broad, its apex obtuse but velutinous. *Staminal cup* entire, thickened, white, obtusely lobed. *Filaments* attached about 2 mm below the edge of the staminal cup, filiform, erect, episepal to 95 mm long; epipetal about 8 mm long. *Anthers* oblong, straight, to 5.3-5.5 long; pollen almost fusiform. *Capsule* globose-tricoccous. *Seeds* semi-circular, black, compressed, with papyraceous margins.

Hab.—In black soil, on rocks or among them, in slopes, at Hacienda Sunchobamba (Caso Grande), about 3500 m above the sea level, dept. of Cajamarca, Perú; also on mount Chungarrán, near Guzmango, prov. of Contumazá, Cajamarca, about 2900 m.

Specimens: Perú, Cajamarca, prov. of Contumazá, cerro Chungarrán; 2900 m; leg. A. Sagástegui, 1-VIII-1960 (type HUT 3387).

This very handsome species I discovered at the Hacienda Sunchobamba (Casa Grande), during explorations in the valley of the Chicama river. Most of plants were growing on rocks in a rich alluvional soil. Unfortunately, in traveling, the dry material was lost together with the description of the species. In the meantime, and as a lucky coincidence, Prof. Sagástegui (University of Trujillo) found the same plant in another area. The specimen was kindly made available to me for study.

The description above was taken from it, complemented with my notes on living plants brought to Buenos Aires. These were not able to resist our damp winter climate.

Stenomesson fulvum (Herb.) Rav. **comb. nov.**

Coburgia fulva Herbert, Edwards' Bot. Reg. 18: tab. 1497. 1832.

This distinct species was overlooked by authors; it has been forgotten in *Coburgia,* a name used in the past for several species of *Stenomesson.*

Coburgia trichroma (Cerv. ex Llav. et Lex.) Herb. seems to be a closely ally. The latter binomial was based on *Pancratium trichromum*, a plant which was cultivated in Mexico (see La Llave & Lexarza, Nov. Veg. Desc. 1: 20. 1824-25). At present the latter species seems doubtful.

Hab.—A native of the Lake Titicaca region, in Perú, and probably also in Bolivia.

Specimens: Perú, Puno, Isla Estébez; leg. Soukup (BA).

Stenomesson coccineum (Ruiz et Pav.) Herb.

Herbert, Appen. Bot. Reg.: 40. 1821.; *Pancratium coccineum* Ruiz et Pavón, Fl. Peruv. Chil. 3: 54: tab. 285. 1802.; *Stenomesson Peruvianum* Traub, Pl. Life 7: 36. 1951.

The complete list of synonymy for this species is given. *S. peruvianum* Traub, collected by Prof. Ferreyra near the type-locality of *S. coccineum,* is apparently the same.

Stenomesson curvidentatum (Lindl.) Herb.

Herbert, Curtis' Bot. Mag. 53: tab. 2640. 1826.; *Chrysiphiala curvidentata* Steudel, Nomencl. Bot. ed. II, 1: 358. 1840.; *Stenomesson pauciflorum* (Lindl.) Herb. var. *curvidentatum* (Herb.) Macbride, Fieldiana Bot. 11: 11. 1931.

Despite its distinctness from *S. pauciflorum* (Lindl.) Herb., *S. curvidentatum* was reduced to varietal rank by Macbride. According to this author, it was never collected again since its introduction in England in 1825.

Stenomesson breviflorum Herb. (Fig. 24)

Herbert, Amaryll.: 199. tab. 28, f. 7-8. 1837.; *Coburgia praecipitata* Herbert, Edwards' Bot. Reg. 28: misc. 54. 1842.; *Coburgia coccinea* Herbert, Curtis' Bot. Mag. 67: tab. 3865. 1841.; Excl. syn.: *Stenomesson coccineum* (Ruiz et Pav.) Herb. (1821).

This very distinct small species, was wrongly considered as a synonym of *Stenomesson coccineum* (Ruiz et Pav.) Herb., by Baker (1888). The latter concept was followed by Macbride (1936). *S. breviflorum* has shorter reddish-pink to red flowers. Its bulbs are prolific of bulblets. I have seen apparently the same in the neighborhoods of Oyon, in the department of Lima, at an altitude of almost 3500 m.

Specimens: Cultivated, from Maclean (photograph of the type of *Coburgia praecipitata* Herb., by courtesy of K).

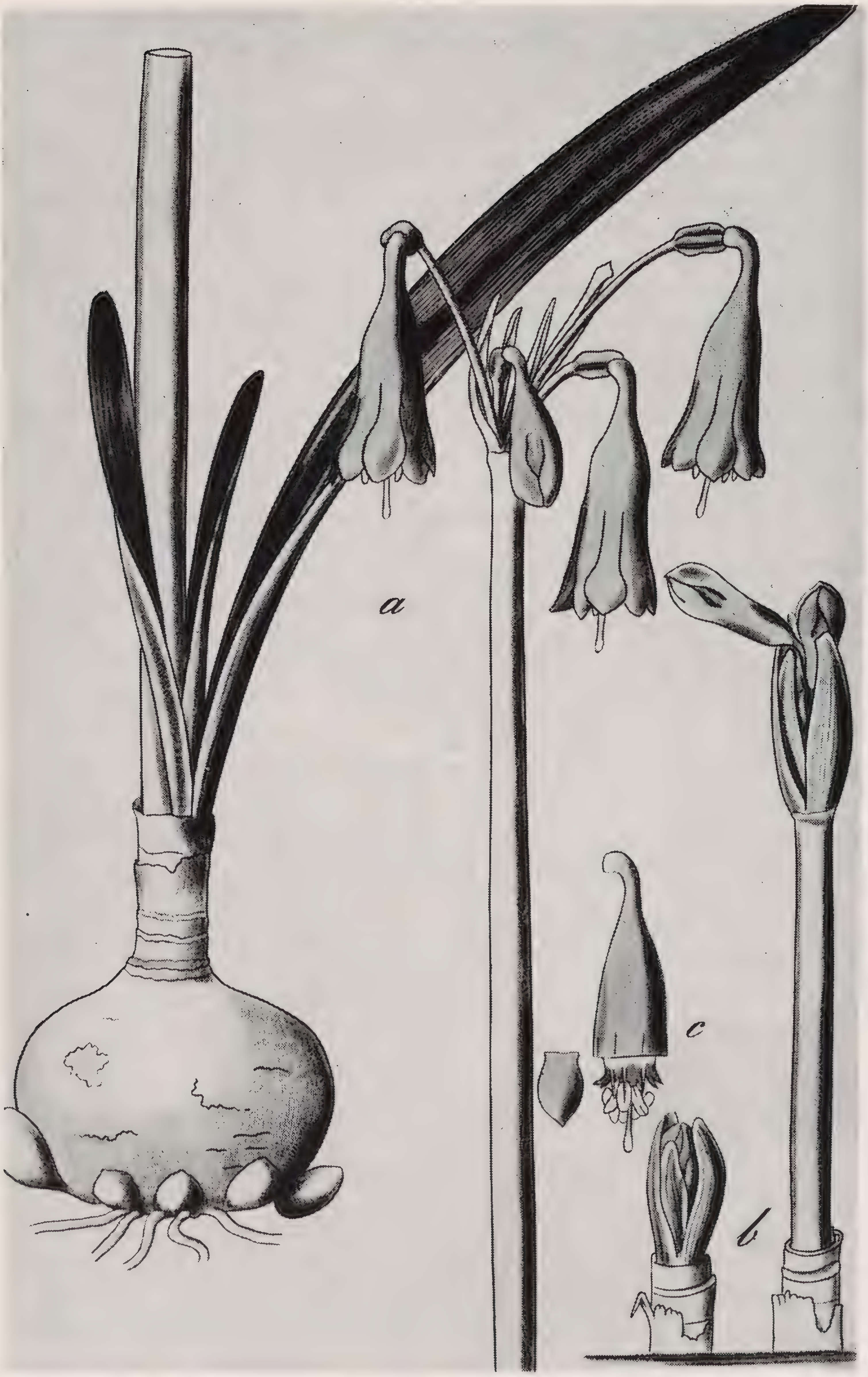

Fig. 24. **Stenomesson breviflorum** Herb., (a) plant with inflorescence; (b) two stages in the growth of the scape; (c) flowers with tepalsegs removed, showing staminal cup, on the left of the tepalseg (all magnified X 1.2). After Curtis' Bot. Mag. 67: tab. 3865. 1841.

Stenomesson flavum (Ruiz et Pav.) Herb.

Herbert, Appen. Bot. Reg.: 40. 1821. (as name but not as plant).; *Pancratium flavum* Ruiz et Pavón, Fl. Peruv. Chil. 3: 54, tab. 284. 1802.; *Stenomesson latifolium* Herbert, Curtis' Bot. Mag. 67: tab. 3803. 1841.; *Stenomesson ruizianum* Kunth, Enum. Pl. 5: 642. 1850.; *Chrysiphiala flava* (Ruiz et Pav.) Ker, Edwards' Bot. Reg. 10: 778. 1824. (as name but not as plant).

Stenomesson flavum has an unfortunate nomenclatural history. The species was hitherto misidentified, since it was classified as *Pancratium flavum* by Ruiz and Pavón.

The misinterpretations began with Ker. In 1824, this author published *Chrysiphiala flava* (Ruiz et Pav.) Ker. He quotes *P. flavum* Ruiz et Pav. under synonymy, therefore, there can be no doubt about his intention of making the new combination. Unfortunately, his description and illustration were made on a different plant: a form of *Stenomesson aurantiacum* (H.B.K.) Herb.

Some years later (1837), Herbert gave a description and a figure of another species under the name *Stenomesson flavum* (Ruiz et Pav.) Herb. (1821). Apparently the plant which he had studied is still unclassified. On the other hand, he redescribes the genuine *S. flavum* as *S. latifolium* Herb. (1841).

Furthermore, it is important to note that *Stenomesson croceum* in the sense of Herbert (1837, p. 199, pl. 28, f. 4), is not the same plant as *Pancratium croceum* Sav. (in Redouté, Liliacées: 4: tab. 187. 1807). Herbert failed again in this respect. It seems possible to me that the plant figured by Redouté is a mixture: the scape in flower, from *Stenomesson aurantiacum,* and the bulb and leaves possibly from a *Zephyranthes.*

Baker (1888), reports *Chrysiphiala flava* Ker-Gawl. (1824) as basonym of *Stenomesson flavum* Herb. (1826). He did not consider the fact that Herbert quotes *Pancratium flavum* Ruiz et Pav., showing his intention of making the new combination upon the latter species. Baker evidently interpreted *S. flavum,* as the plant figured by Ker, which is a form of *Stenomesson aurantiacum.* Moreover, Baker includes *Pan*cratium flavum, Ruiz et Pav., under synonymy of *Stenomesson croceum* (Sav.) Herb. (a doubtful species, see above). *S. ruizianum* Kunth, also quoted as synonym of the latter species, is an additional superfluous name for *S. flavum* (Ruiz et Pav.) Herb.

Furthermore, Baker recognizes two varieties under *S. flavum* (sensu Bak.). The first, var. *latifolium,* was based on *S. latifolium* Herb. which is an absolute synonym of *S. flavum* (Ruiz et Pav.) Herb. It must be noted that *S. vitellinum* Lindl., quoted as synonym of this variety, is a different species. The second variety, *curvidentatum,* must be referred to *S. curvidentatum* (Lindl.) Herb. *Chrysiphiala pauciflora* Lindl., under synonymy, if correctly delineated (see Hook. Exot. Fl.: 2: tab. 132. 1823-27) may be considered as different; its erect wider flowers disagree with *S. curvidentatum* Herb.

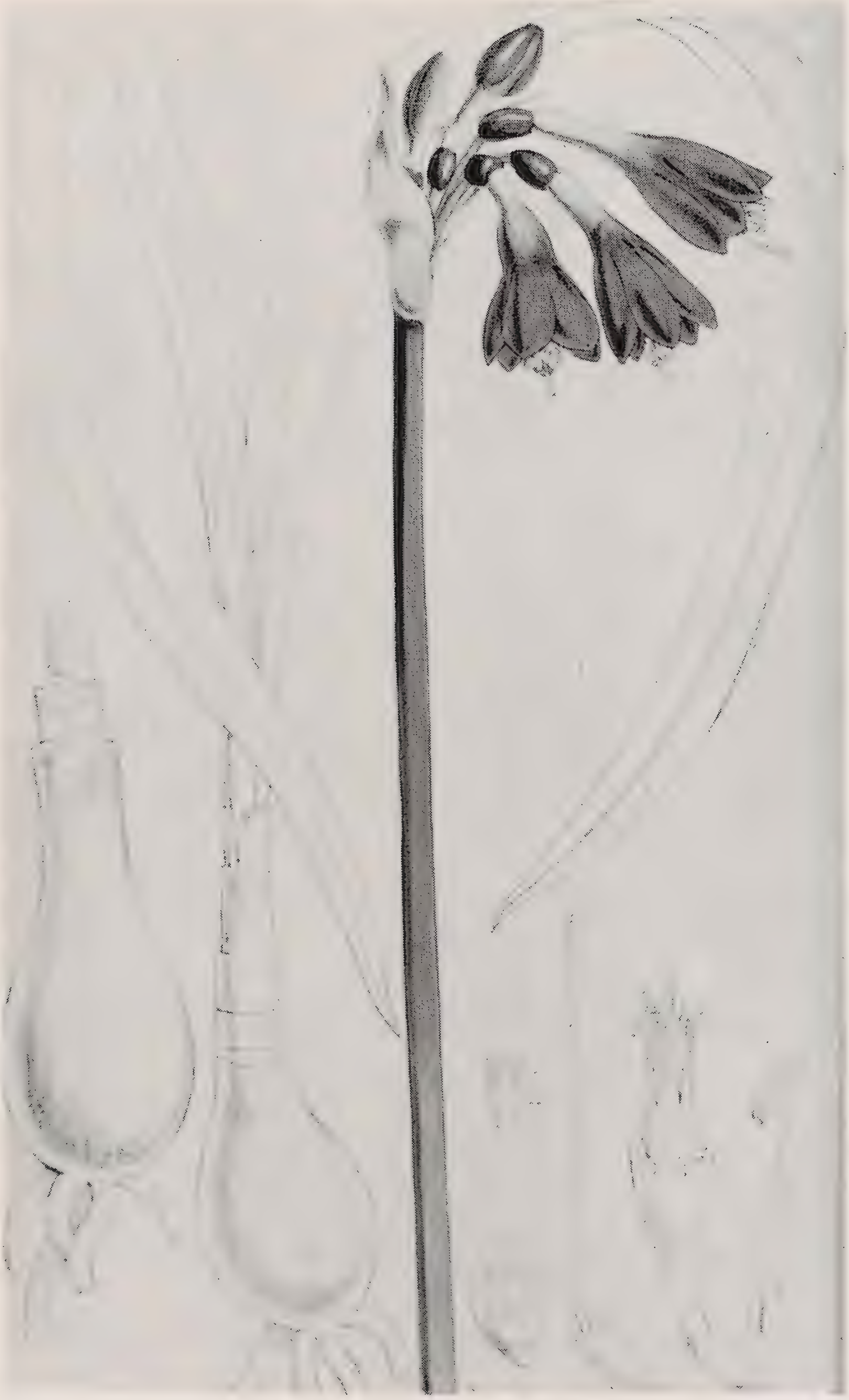

Fig. 25. **Stenomesson aurantiacum** (H. B. K.) Herb., copy of illustration accompanying the description of **S. suspensum** Bak. (Saund. Refug. Bot. 1: tab. 22, 187, 1869), by courtesy of Kew Gardens.

Macbride (1936), in his treatment of the *Amaryllidaceae* for the "Flora of Peru", follows Baker except that he revalidates *Stenomesson latifolium* Herb. as a species, quoting *Chrysiphiala flava* Ker, *Stenomesson flavum* Herb. and *S. flavum* of auth. not R. & P. (sic!), under its synonymy. The latter statement is, in my opinion, untenable.

The species was collected by Ruiz and Pavón on the Lurín hills, near the Pachacamac castle. I gathered bulbs in the latter locality and also in several coastal elevations from the Lima department to Trujillo (La Libertad). A few plants flowered here in Buenos Aires.

Specimens: Perú: dept. of Lima, cerro Agustinos, 300-400 m; leg. Soukup 1437, XI/XII-1940 (SI).

Stenomesson aurantiacum (H. B. K.) Herb. (Fig. 25)

Herbert, Appen. Bot. Reg.: 40. 1821.; *Pancratium aurantiacum* H.B.K., Nov. Gen. Sp. Pl. 1: 280. 1816.; *Chrysiphiala aurantiaca* (H.B.K.) Schultes, Roem. et Schult. Linn. Syst. Veg. 7(2): 904. 1830.; *Stenomesson eustephioides* Herbert, Edwards' Bot. Reg. 29: misc. 62. 1843.; *S. hartwegii* Lindley, loc. cit. 30: tab. 42. 1844.; *S. suspensum* Baker, Saunders' Refug. Bot. 1: tab. 22, 187. 1869.

Plant about 15-30 cm high. *Bulb* ovoid to 55 mm long, 45 mm in width, produced into a pseudoneck. *Leaves* none at the flowering time, petioled; the blade lanceolate, a dark green in the adaxial face, a whitish-green and with a thick midrib in the abaxial face, revolute in vernation, to 33 cm long, 25-35 mm broad. *Scape* cylindrical, not fistulose. *Spathe* bivalved, marcescent 2-5-flowered; inner bracts two or more. *Pedicels* cylindrical to 3 cm long, recurved at the apex. *Flowers* nodding, a bright orange-red, infundibulate. *Ovary* oblong, obtusely trigonous, green, to 6.8 mm long, 4.5 mm wide. *Perigone-tube* curved about 8-9 mm long. *Tepals* connated for 11 mm, narrowly elliptic, about 9-12.5 mm long, 4.5-5.4 mm broad, the outer series with a short apiculum (to 0.5-0.7 mm long), the inner often obtuse. *Filaments* slightly biseriated about 10-11 mm long, connated into a staminal cup for 5-6 mm; teeth absent. *Anthers* narrowly elliptic to 2.4-3.3 mm long. *Style* about 38 mm long. *Stigma* capitate.

Hab.—Northern Peru (dept. of Piura) to northern Ecuador (prov. of Imbabura), at an elevation of 2800-3500 m over the sea level.

Specimens: Ecuador, prov. of Pichincha, slopes of the Pichincha volcano (above the city of Quito), 3000 m; leg. Ravenna 236, 20-VII-1963 (Herb. Ravenna). Idem, prov. Imbabura, Lake Cuicocha, near Otavalo; leg. ipse 256, 4-VIII-1963 (Herb. Rav.).

Stenomesson suspensum Bak., is a further synonym of this species. I have collected it in the slopes of the Pichincha volcano, above the city of Quito, Ecuador, where it grows abundantly, associated with *Sisyrinchium jamesoni* Bak. *(Iridaceae)*. I found it also in the north of the country, at lake Cuicocha, near Otavalo, growing near *Phaedranassa dubia* (H.B.K.) Macbr. Moreover, the plant is quite common in the department of Piura, Perú, as for instance, on the way to Huancabamba and near Ayabaca.

An additional synonym for **Stenomesson humile** and report of the genus in Argentina

Stenomesson humile (Herb.) Baker, Saunders Ref. Bot. 5: tab. 308, 114. 1872.; *Clitanthes humilis* Herbert, Edwards' Bot. Reg. 25: misc. 87. 1839.; *Coburgia humilis* (Herb.) Herbert, loc. cit. 28: tab. 55. 1842.; *Crocopsis fulgens* Pax, Engler Bot. Jahrb. 11: 324, tab. 7, f. 1-4. 1890.; *Stenomesson acaule* Kraenzlin, loc. cit. 40: 237. 1908.; *Zephyranthes pseudocolchicum* Kraenzlin, Fedde Rep. 8: 118. 1915.

Some time ago I asked on loan, from the Botanisches Museum of Berlin-Dahlem, the type of *Zephyranthes pseudochicum* Kraenzl. This species served Traub (1951, p. 43) for erecting the monotypic section *Brachylirion,* described as ''stamens subequal; style straight; peduncle included in the neck of the bulb''.

After the type-sheet reached my hands, a careful dissection was made on one of the mounted plants. As a result, I noted that they represented *Stenomesson humile* (Herb.) Bak. Therefore, the section *Brachylion* Traub, becomes a synonym of subgenus *Clinanthus* Herb., within *Stenomesson.*

Cabrera (1957) quotes *Crocopsis fulgens* Pax, in the province of Jujuy. Traub (1963) placed *Crocopsis* Pax under synonymy of *Stenomesson.* Despite these facts, the presence of the latter genus in Argentina, was not formally reported. The southern most record of the genus is found in Tucuman. Some specimens from the high mountains of the latter province, are here referred to *Stenomesson humile* (Herb.) Bak. for the first time.

Hab.—Andes of Peru, Bolivia and Argentina, from depts. of Lima and Junin, in Peru, to the province of Tucumán in Argentina. It grows at high elevation (3000-4200 m above the sea level), especially in a dry semi-arid soil.

Specimens: Argentina: Tucumán, dept. Trancas, Quebrada del Chorro, 3000 m; leg. Schreiter 625, XII-1917 (LIL). Idem, San Pedro de Colalao, Lomas de Gualinchay; leg. M. Lillo s/n, X-1915 (LIL 30761). Jujuy, Mina Pirquitas; leg. Cabrera 9331 (BAB, LP). Idem, dept. Tilcara, al oeste de Huacalera, 3850 m; leg. D. Werner 896, 30-X-1967 (LP).

Bolivia: Auf steinigem Boden des Cerro de Oruro (''Onero'', sic!), 3950 m ü d M.; leg. Herzog 2524 (type of *Zephyranthes pseudocolchicum* Kraenzl. B)

VI. STUDIES IN THE GENUS **GRIFFINIA**

Griffinia concinna (Mart.) Rav. **comb. nov.** (Fig. 22-B)

Crinum concinnum Martius, in Roemer et Schultes Linn. Syst. Veg. 7(2): 857. 1830.

Crinum concinnum Mart., seemed to have an unusual habitat in the highlands of Minas Gerais. In fact, *Crinum* species are confined, in

South America, to lowlands, river estuaries and sea shores. In order to verify the status of the species, the type was requested, on loan, to the Botanisches Anstalten of München (M).

The specimen consisted of a scape in flower; bulb and leaves were lacking. After an accurate examination, some features of importance were noted: the large flowers were lilac, with narrow tepals, and the upper episepal stamen was ascending, partially hidden by its own tepal; the rest of stamens were declined. In other words a *Griffinia* species was revealed.

Griffinia concinna is closely related with *G. dryades* (Vell.) M. Roem., from which is separable mainly because of its very short pedicels.

Specimens: Brazil: In campis montibus prope Villa Rica, Minas Gerais; leg. Martius (type M).

VII. AN ADDITIONAL SPECIES IN THE GENUS **TRISTAGMA**

In Traub's brief statement of the genus *Tristagma* (1963), one species was overlooked. It was described in the genus *Milla* by Baker (1875), and lately figured in Curtis' Botanical Magazine (v. 102).

Tristagma leichtlinii (Bak.) Rav., **comb. nov.** (Fig. 26)

Milla leichtlinii Baker, Gard. Chron. 1875 (1): 234.—Curtis' Bot. Mag. 102: tab. 6236. 1876.

A distinct species allied to *T. sessile* (Phil.) Traub. The latter has one-flowered, practically subterranean, spathe; moreover, the sessile flowers have longer filaments inserted in the inside of the tube. In *T. leichtlinii,* however, although congested and somewhat hidden by the leaf sheaths, spathes are not subterranean, and they are 2—3-flowered; the flower is shortly pedicellate but not sessile, and filaments are inserted at the throat of the tube.

It flowers immediately after the spring thaw; leaves and inflorescences develop simultaneously. I have seen it in flower, in October, at Farellones, near the top of the mountains above Santiago.

VII. **NOTHOSCORDUM** NOTES 1970

A new species from the Uruguay Republic is described. A bulb of this was gathered by Dr. John Christie at Punta Ballena, not far from Punta del Este, and given to me for study.

Nothoscordum balaenenese sp. nov.

Species a *N. bonariensi* affinis sed foliis latioribus carinatis vel subcarinatis striatis tepalis latioribus ovato-lanceolatis differt.

Plant to 24 cm tall. *Bulb* pyriform or oblong-pyriform, to 25-30 mm long, 7-9 mm broad, whitish. *Leaves* 3-4, spreading upright, to 10-17.5 cm long, 3-3.5 mm broad, linear, a dark green, not pruinose, somewhat striate, channelled, carinate or subcarinate, scabrous on the keel and margins, obtuse. *Scape* erect to 20 cm long, 1.3-1.7 mm broad (some-

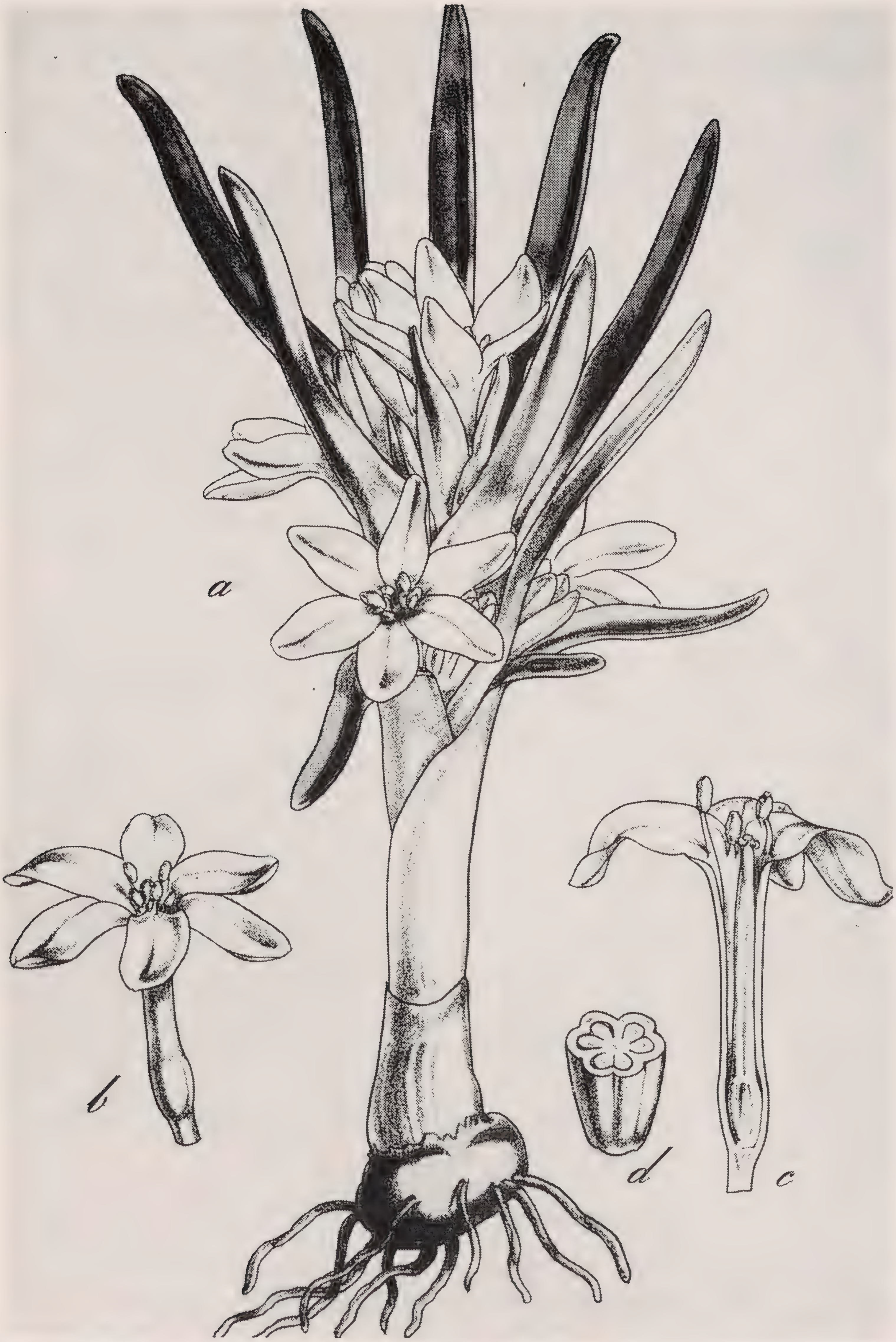

Fig. 26. **Tristagma leichtlinii** (Bak.) Rav., (a) general view of plant (X 1.17); (b) flower (X 1.17); (c) long section of flower (X 1.25); **(d)** transverse section of ovary (X 4). After Curtis' Bot. Mag. tab. 6732.

what broader at base), pruinose. *Spathe* ca. 9-flowered, the valves free to the base, clasping, subequal, membranous, lanceolate, marcescent, whitish-hyaline with diminutive reddish streaks, ca. 12 mm long. *Pedicels* slender to 21-22 mm long. Expanded flowers at first three, white, green at the base, ca. 15-16 mm in diam., very fragrant. *Tepals* broadly lanceolate or ovate-lanceolate, connate for 1.5 mm, rarely the outer pink-tinged, outer to 7.5 mm long, 4.2 mm broad, inner subequal, ca. 3.3-4 mm broad. *Filaments* narrowly lanceolate, white, sepaline 4.8 mm long, petaline 5 mm long, both series green at the base for 0.8 mm. *Anthers* versatile, yellow, at dehiscence subreniform, ca. 1 mm long. *Ovary* oblong or prismatic-oblong, ca. 2.5-2.6 mm long, 1.4-1.5 mm broad, a pale green. *Style* filiform white, to 5.4-5.5 mm long; stigma capitate.

Hab.—In stony and rocky places of Punta Ballena, on the coast of the Uruguay Republic. It grows near *Habranthus estensis* sp. nov. (inedit), *H. gracilifolius* Herb., *Tristagma recurvifolium* (C.H.Wr.) Traub, *Stenandrium trinerve (Acanthaceae)*, *Oxalis macachin* and *O.* sp. Cultivated in my collection.

Specimens: Culta in Bonaria ex bulbo a J. Christie in Punta Ballena dep. Maldonado Uruguariae collecto; leg. Ravenna 1030, VI-1970 (typus in Herb. Ravenna).

Nothoscordum balaenense is somewhat related to *N. bonariense* (Pers.) Beauv.; it differs, however, by the different shape of tepals and filaments. Some of Beauverd's species also approach to our plant. These are: *N. grossibulbum,* which has leaves 1 mm broad and a scabrous scape; *N. minarum,* with "very narrow linear leaves" and yellow tepals; *N. scabridulum,* which bears leaves 1.3 mm broad and tepals 2-2.5 mm broad; *N. nudum* has no leaves at flowering time and anthers are 2 mm long. *N. balaenense* does not match any of the mentioned characters. The species seems to be endemic in stony places of the Uruguayan coast. I was unable to trace it in any of the Herbaria from Uruguay.

VIII. ERRATA IN THE SECOND PART OF THIS SERIES

On page 56 of Plant Life 25, 1969:

[A] In the key of the tribe *Stenomesseae,* the genus *Pamianthe* was omitted. The alternative contrasting characters under 2b must be as follows:

2b. Staminal cup very large, prominent, not hidden by the tepals.
  3a. Stamens arising from the inner surface of the staminal cup, some distance below its edge ....*PARAMONGAIA*
  3b. Stamens arising from the edge of the staminal cup ....*PAMIANTHE*

[B] Under 3b, Key to species of *Phaedranassa,* characters which separate *Phaedranassa schyzantha* and *Ph. lehmanni,* must be corrected as follows:

7a. Stamens exceeding the perigone for 17-20 mm. Flowers constricted at the end of the concrescent portion of tepals ....*Ph. lehmanni*

7b. Stamens exceeding the perigone for only 6.35 mm. Flowers not constricted .... *Ph. schyzantha*

LITERATURE CITED

Baker, J.G., New Garden plants; Gard. Chron. 1875(1) : 234.

——, *Milla leichtlinii;* Curtis' Bot. Mag. 106 : tab. 6236. 1876.

——, *Zephyranthes xyphopetala,* in Rusby, On the collections of Mr. Beauverd, G. Nouvelles espéces uruguayennes du genre *Nothoscordum* Kunth. Bull. Herb. Boiss. Ser. II. 8 : 993—1007. 1908.

Miguel Bang in Bolivia.-II.; Mem. Torr. Bot. Club 4 : 268. 1896.

Böcher, T. W., Hjerting, J.P. & Rahn, K., Botanical studies in the Atuel area, Mendoza province, Argentina; Dansk Botanisk Arkiv 22(2) : 125, 1968.

Cabrera, A.L., Manual de la flora de los alrededores de Buenos Aires: 145-148. 1953.

——, La vegetación de la puna argentina; Rev. Inv. Agr. 11(4) : 317-412. 16 tabs. 1957.

Cavanilles, A.J., Icones et descriptiones plantarum, . . . 2: 76, Madrid 1793.

Dietrich, D.N.F., Synopsis plantarum seu. . . . 2: 1176. 1840.

Fabris, H.A., Amaryllidaceae; Cabr. Fl. prov. Buenos Aires, 1: 520-535. 1969.

Hauman, L. & Vanderveken, G., Catalogue des Phanérogames de l'Argentine; *An. Mus. Hist. Nat.* Buenos Aires 29 : 274-286. 1917.

Herbert, W., Appendix [Bot. Reg.], London, 1821.

——, *Habranthus bifidus;* Curtis' *Bot. Mag.* 52 : tab. 2597. 1825.

——, *Haylockia pusilla;* Edwards' *Bot. Reg.* 16 : tab. 1371. 1830.

——, *Habranthus bagnoldi;* loc. cit. 17 : tab. 1396. 1831.

——, *Amaryllidaceae,* 428 ps., London 1837.

——, *Stenomesson latifolium;* Curtis' *Bot. Mag.* 67 : tab. 3803. 1841.

Hicken, C. M., Chloris platensis Argentina; *An. Mus. Hist. Nat.* 2: 69-72. 1910.

Holmberg, E. L., Amarilidáceas argentinas indígenas y exóticas cultivadas; *An. Mus. Hist. Nat.* Buenos Aires 12: 75-191. 1905.

Humboldt, A. von, Bonpland A.J.A., & Kunth, R.G.P., Nova Gen. Sp. Pl. 1: 280. 1816.

Hunziker, A. T., Estudios sobre Amaryllidaceae III; *Kurtziana* 5: 359-367. 1969.

Ker, J. Bellenden, *Chrysiphiala flava;* Edwards' *Bot. Reg.* 10: tab. 778. 1824.

Kränzlin, Fr., Plantae novae andinae imprimis Weberbauerianae III; Engler Bot. Jahrb. 40: 237-239. 1908.

——, Novitiae quaedam Bolivianae; Fedde *Rep.* 13: 118. 1914.

Kunth, C. S., Enumeratio plantarum vols. 1-5. 1833-50.

Lamarck, J. B. Monnet, Encyclopedie Méthodique Botanique: 125. 1783.

L'Héritier, C. L. de Brutelle, Sertum Anglicum: 10, London 1788.

Lindley, J., Collectanea botanica: tab. 11, London 1821.

Loddiges, C., *Habranthus pallidus; Bot. Cab.* 18: tab. 1760. 1831.

Martius, K. F., *Crinum concinnum;* Roem. et Schult., Linn. Syst. Veg. 7(2): 857. 1830.

Philippi, R. A., Plantas nuevas chilenas; *An. Un. Chile* 94: 146-158. 1896.

Poeppig, E. F., Fragmonta plantarum siphonogamarum, 30 ps., Leipzig 1833.

Ravenna, P. F., Contribuicões ao estudo das Amaryllidaceae da América do Sul I.; *Sellowia* 19: 25-36. 1967.

——, Contributions to South American Amaryllidaceae, II; Pl. Life 25: 55-76. 1969.

Ruiz, H. & Pavon, J., Flora Peruviana et Chilensis 3: 54-57. 1802.

Spegazzini, C., Ramillete de plantas argentinas nuevas o interesantes; *Physis* 3: 40-42. 1917.

Sprengel, K., Plantarum minus cognitum pugillus primus et secundus 2: 59. 1815.

Traub, H., Amaryllid notes; *Pl. Life* 7: 42-43. 1951.

——, The genera *Rhodophiala* and *Phycella;* loc. cit. 12: 67-74. 1956.

——, Amaryllid notes 1963 [*Tristagma*]; *loc. cit.* 19: 60-61. 1963.

——, The genera of Amaryllidaceae, 1963.

—— & Moldenke, H., Amaryllidaceae, tribe Amarylleae, 194 ps., ill. Standford (Cal.) 1949.

A NEW **MILLA** SPECIES FROM MEXICO

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During my explorations in Mexico in 1963, I had the opportunity of going over the same route followed by Pringle, in the Sierra de San Felipe, in the State of Oaxaca. At that time I was searching for *Iridaceae.* Nearly halfway up the mountain top, I found a *Milla* species which proved to be new.

Milla oaxacana Rav. **sp. nov.**

Planta flexuosa gracilis usque 35 cm alta. Cormus parvus depresso-globosus ad 10-12 mm latus tunicis fibrosis obtectus. Folia ad anthesin dua laxe procumbens cylindrica laevia fusco-viridia, usque 40 cm longa circ. 2mm lata. Scapus teres gracilis usque 23 cm longus circ. 1.5-1.7 mm latus. Spatha bivalvata biflora; valvae subaequales divergentes lanceolatae membraceae ad 5-6 mm longae basin circ. 0.7 mm connatae; bracteae interiores duae parvae inaequales ad 1.5 mm et 2.5 mm longae. Flores sessiles rotacei albi extus viridescentes ad 14.4 cm longi circ. 30-32 mm lati. Perigonii tubus gracilis viridescens ad 14 cm longus ad basin circ. 1 mm latus prope apicem leviter ampliatus in vivo circ. 2.5 mm latus. Tepala oblanceolata, exteriora ad 17-18 mm longa, usque 3 mm lata in facie abaxiale usque 6-7 nervis viridis notata breviter apiculata, apiculus fusco-viride circ. 0.7-0.8 mm longus ad sinum glandulosopapillosus, interiora ad 6.5 mm longa circ. 5 mm lata obtusa in facie abaxiale praecipue nervis tribus notata. Filamenta complanata oblongolanceolata ad basin ampliata subaequalia ad 1.7 mm longa ad basin circ. 0.75 mm lata. Antherae introsae oblongae lutae ad sextum inferiorem dorsifixeae usque 2.7-3 mm longae prope basin circ. 0.6-0.7 mm latae. Ovarium anguste fusiforme stipitatus faucem tubi haud aequante ad 6.5 mm longum circ. 0.7-1 mm latum; stipes usque 11 mm longus ad faciem interiorem perigonii tubi insertus. Stylus filiformis ad 10 mm longus perianthium circ. 7 mm superante. Stigma capitato-trilobus ad 1.5-1.6 mm latus glandulis oblongis circ. 0.2 mm longis instructus.

Plant flexuose, weak, to 35 cm tall. *Corm* small, depressed-globose, about 10-12 mm in width, covered with fibrous coats. *Leaves* two at anthesis, laxly curved, smooth, of a dark green, cylindrical, to 40 cm long, 2 mm broad. *Scape* cylindrical weak about 23 cm long, 1.5-1.7 mm wide. *Spathe* bivalved, two-flowered; valves subequal, diverging, lanceolate, membranous, to 5-6 mm long, connated for 0.7 mm at the base; inner bracts two, small unequal, about 1.5 and 2.5 mm long. *Flowers* sessile rotaceous, white, greenish on the outside, to 14.4 cm long, 30-32 mm in diameter. *Perigone-tube* weak, greenish to 14 cm long, 1 mm wide, slightly ampliated at the apex (about 2.5 mm wide in fresh flowers). *Tepals* oblanceolate, the outer to 17-18 mm long, 3 mm broad, marked with 6-7 veins on the abaxial face, shortly apiculate; apiculum of a dark green, about 0.7-0.8 mm long, glandular-papilose in its sinus; the inner to 6.5 mm long, 5 mm broad, obtuse, with three veins on the abaxial face. *Filaments* flattened oblong-lanceolate, broader at the base, subequal, about 1.7 mm long, 0.75 mm broad at the base. *Anthers* introrse, oblong, yellow, dorsifixed in the lower sixth, to 2.7-3 mm long, 0.6-0.7 mm broad near the base. *Ovary* narrowly fusiform, stipitate, not reaching the mouth of the tube, about 6.5 mm long, 0.7-1 mm in width; stipe to 11 mm long, attached to the inner surface of the tube. *Style* filiform about 10 mm long, exceeding the perianth for 7 mm. *Stigma* capitate-trilobed to 1.5-1.6 mm wide, covered with oblong glands, 0.2 mm long.

Hab.—Southern Mexico, on the Sierra de San Felipe, State of Oaxaca. It grows in the shade under Oak trees near *Oxalis deppei, Aliium* sp. and *Calochortus* sp.

Specimens: Culta in Bonaria ex bulbis ad meridionem Mexicii ad Sierra de San Felipe civit. Oaxacae collectis; leg. Ravenna 403, aest. 1965 (typus in Herb. Ravennae).

This graceful *Milla* species is closely related with *M. biflora* Cav. The latter has much larger flowers with tepalsegs connate, abruptly narrowed near the base, and it is a much more robust plant confined, as far as I have seen, to northern drier regions. It seems possible that the existing records of *M. biflora* in southern Mexico and Guatemala, should, in the future, be referred to *M. oaxacana,* rather than to the former. I have examined and collected *M. biflora* near Guadalajara (Jalisco),

RAVENNA—NEW MILLA SPECIES—continued on page 60.

3. GENETICS AND BREEDING

AMARYLLIS CHROMOSOME STUDIES

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INTRODUCTION

Recent literature (4, 6) on plant chromosome numbers has added little if any information on the genus *Amaryllis.* The reason for this is largely that the people (excluding the commercial breeders) possessing the largest and best collections of species and hybrids lack the necessary equipment. Many techniques for determining chromosome numbers are available but all require a microscope, an instrument which few amateur collectors and breeders have available. These same people when faced with crossing failures must speculate on the reasons for failure and frequently include differences in chromosome number. The purposes of this paper are to provide information on chromosome numbers of some amaryllis species and cultivars, explain some reported crossing failures, and describe the techniques used to determine the chromosome numbers.

MATERIALS AND METHODS

Actively growing root tips obtained from Mr. Fred J. Buchmann, Baton Rouge, Louisiana, of the species *Amaryllis yungacensis,* the cultivars 'White Christmas', 'Maria Goretti', and the cross 'White Christmas' x *A. yungacensis* were collected at 10 a.m. Some root tips were immediately fixed in acetic-alcohol (1 part glacial acetic acid: 3 parts absolute ethyl alcohol) and others were treated for 3 hours with either of two chromosome contracting and division arresting chemicals prior to fixing. The chemicals used were a cold saturated aqueous solution of para-dichlorobenzene (PDB) and a 0.01% aqueous solution of colchicine at room temperature. Treated root tips were washed in running tap water for 15 minutes prior to fixing in acetic-alcohol. The root tips were stained using the Feulgen technique (7), squashed and the slide preparations made permanent prior to observing.

Chromosome counts were also obtained using pollen according to a technique developed by Burnham (3). The pollen was cultured in 2 ml of the Brewbaker and Kwack (1) liquid medium containing in parts per million, 100 H_3BO_3, 300 $Ca(NO_3)_2 \cdot 4H_2O$, 200 $MgSO_4 \cdot 7H_2O$, and 100 KNO_3; with 0.005% colchicine and 10% lactose. After 18-23 hours incubation at 22 C, pollen tubes were harvested by centrifugation and fixed with acetic-alcohol. Feulgen staining was carried out in the culture tubes with fluid changes made after the centrifugation following each step. Feulgen-stained, resin mounted preparations of pollen tubes with arrested metaphases were observed and the chromosomes counted.

Pollen used in this study was obtained from Mr. J. L. Doran, Burbank, California, and Dr. E. N. O'Rourke. The samples of pollen obtained from Mr. Doran were D-25, D-32 (*Amaryllis blossfeldiae* Traub & Doran (9)), and D-52, three of the acquisitions reported by him in Plant Life 1970 (5). This pollen had been stored with a dessicant in a refrigerator prior to air mailing from California and was refrigerated about 2 weeks in Louisiana. The pollen obtained from Dr. O'Rourke was that of the Ludwig hybrid 'Wedding Bells'. This pollen was collected 1-2 days before culturing and was refrigerated.

RESULTS AND DISCUSSION

Varying success was obtained with the chromosome contracting and division arresting chemicals. PDB gave unsatisfactory results. The untreated and colchicine treated root tips provided many cells with countable chromosomes (Fig. 27). The chromosome numbers determined using root tips are:

'White Christmas'	$2n = 4x = 44$	tetraploid
'Maria Goretti'	$2n = 4x = 44$	tetraploid
A. yungacensis	$2n = 2x = 22$	diploid
'White Christmas' x *A. yungacensis*	$2n = 2x = 33$	triploid

The chromosome counts on 'Maria Goretti', 'White Christmas', and *A. yungacensis* provide considerable enlightenment on the crosses described by Buchmann (2). Buchmann reported a lack of success in selfing, sibbing, and backcrossing the hybrid from the 'White Christmas' x *A. yungacensis* cross. According to the present study, the parents are tetraploid and diploid respectively and the hybrid a triploid. Since most of the gametes formed by triploids do not have a balanced complement of chromosomes, very few are viable. The progeny that may be produced are generally aneuploids.

Buchmann also described his cross 655 [(*A. evansiae* x *A. aglaiae)* x *A. evansiae*) x 'Maria Goretti'] as being self and sib sterile. *A. evansiae* is described in the literature (8) as being a diploid with 22 chromosomes. Since the cross *A. evansiae* x *A. aglaiae* was fertile as evidenced by the backcrossing to *A. evansiae,* it might be assumed that *A. aglaiae* is also a diploid with 22 chromosomes. This should be verified by an actual count. In the present study, the cultivar 'Maria Goretti' was found to be a tetraploid with a 2n chromosome number of 44. Therefore, the seedlings obtained from Buchmann's cross 655 are most likely triploids. Their self and sib sterility is, therefore, explained on the basis of an unbalanced gamete chromosome complement. The pollen fertility of these seedlings reported by Buchmann when backcrossed to the diploid seed parent does not eliminate the possibility of the triploid condition. During selfing and sibbing, unbalanced gametes were present on both the pollen and seed side of the cross but in the backcross the diploid seed parent possessed gametes with a balanced chromosome complement. Suspected chromosome numbers should be verified and the seedlings obtained from the backcross of Buchmann's cross 655 to the diploid seed parent checked for aneuploidy.

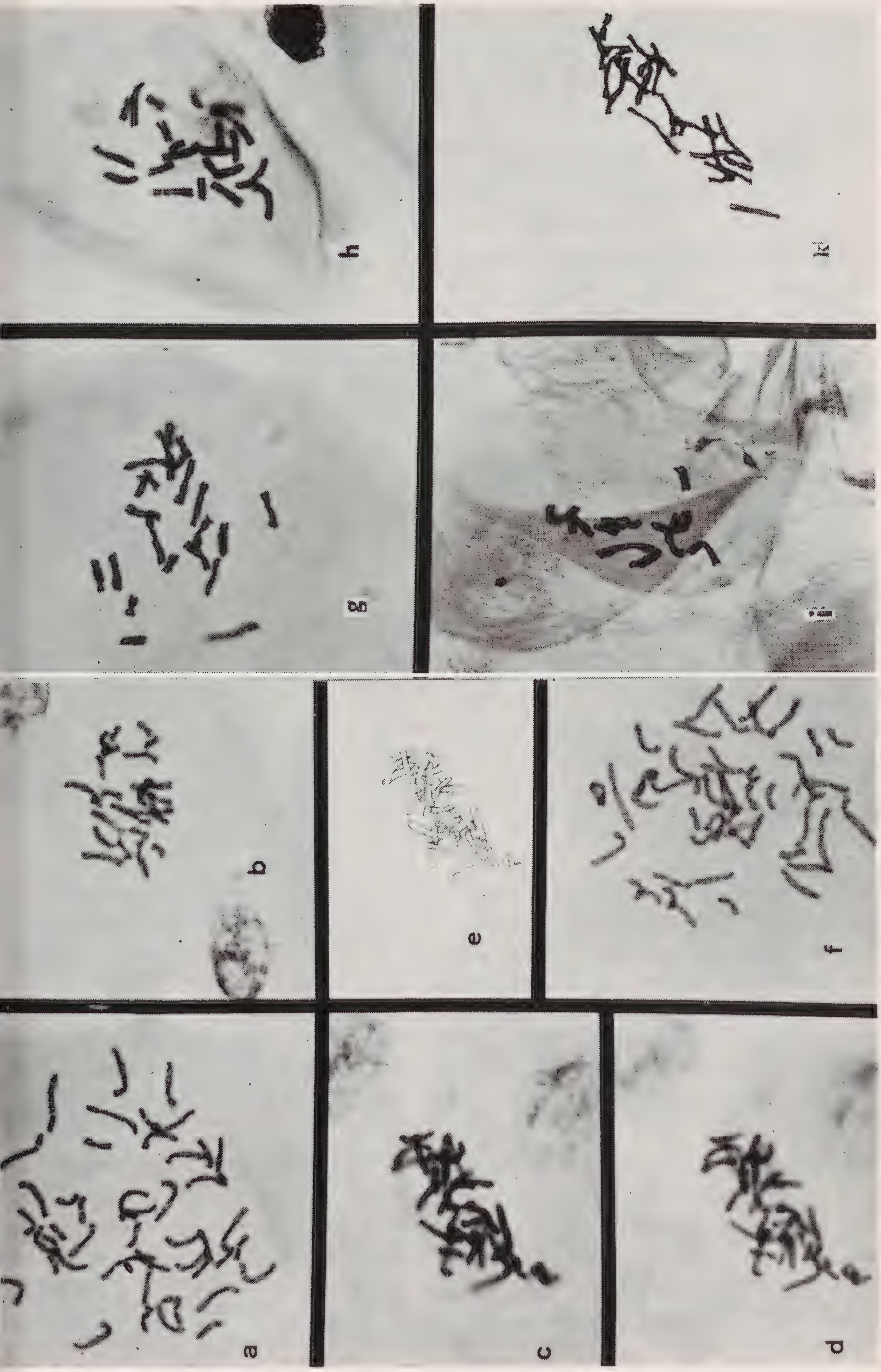

Fig. 27. Root tip squashes of **(a)** 'White Christmas,' **(b) Amaryllis yungacensis, (c)** 'White Christmas' x **A. yungacensis, (d)** same as **(c)** but focused at different depth to show overlapping chromosomes, **(e)** composite drawing of c and d, and **(f)** 'Maria Goretti.'

Haploid metaphases of chromosome in generative nuclei of pollen tubes: **(g)** D-25; **(h)** D-32; **(i)** D-52, and **(k)** 'Wedding Bells.'

The pollen culture technique gave good results and provides an additional means to determine chromosome numbers. Different pollens required different culturing times to obtain the greatest number of pollen tubes containing countable chromosomes. The chromosome counts determined are:

D-25	$2n = 4x = 44$	tetraploid
D-32 (*A. blossfeldiae*)	$2n = 4x = 44$	tetraploid
D-52	$2n = 2x = 22$	diploid
'Wedding Bells'	$2n = 4x = 44$	tetraploid

Since the number of chromosomes in the gametes is less than that in the root tips, the pollen culture technique provides an easy means of determining chromosome numbers. Root tips of diploids and tetraploids have 22 and 44 chromosomes respectively while the pollen tubes contain 11 and 22. (Fig. 27.) Pollen tube counts with triploids, other odd numbered levels of euploidy, and aneuploids can be misleading. Pollen from triploids can contain chromosome complements indicative of diploids and tetraploids and all levels of aneuploidy between. Chromosome counts, especially from pollen tubes, should not be based on single determinations but *should be verified through multiple observations.*

LITERATURE CITED

1. Brewbaker, J. L. and Kwack, B. H. 1963. The essential role of calcium ion in pollen germination and pollen tube growth. *Am. J. Botany,* 50: 859-65.

2. Buchmann, F. J. 1970. Hybridizing with amaryllis species—1969. *Plant Life,* 26: 108-112.

3. Burnham, M. 1970. A centrifugation technique for preparing medium-free resinous mounts of Feulgen-stained pollen tubes. *Stain Techn.* 45: 5-7.

4. Cave, M. S. 1958-1965. Editor. *Index to plant chromosome numbers for 1956-1964.* Volumes 1 and 2. University of North Carolina Press, Chapel Hill, North Carolina.

5. Doran, J. L. 1970. Collecting South American amaryllids, 1964-68. *Plant Life,* 26: 49-56.

6. Ornduff, R. 1967, 1969. Editor. *Index to plant chromosome numbers for 1965 and 1967.* International Bureau for Plant Taxonomy and Nomenclature. Regnum vegetabile, Volume 50 and 59. Ulrecht, Netherlands.

7. Sharma, A. K. and A. Sharma. 1965. *Chromosome Techniques.* Butterworths. London.

8. Traub, H. P. 1958. *The Amaryllis Manual.* Macmillan Company, New York.

9. Traub, H. P. and J. L. Doran, *Amaryllis blossfeldiae* sp. nov. PLANT LIFE 27: 44—46. 1971.

IDENTIFICATION AND CHARACTERIZATION OF THE ANTHOCYANIN PIGMENTS IN VARIOUS **AMARYLLIS** SPECIES AND CULTIVARS

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INTRODUCTION

The anthocyanin pigments are responsible for most of the pink, red, violet, and blue colors found in the leaves and petals of higher plants. These pigments add to the attractiveness of many horticultural species, and also attract many insects and birds which assist in pollination.

Very little research has been done on the anthocyanins of the *Amaryllidaceae.* Harborne (1) tentatively identified the anthocyanin pigments in various *Amaryllis* Linn. 1753 (syn.—*Hippeastrum* Herb. 1821) cultivars as Pelargonidin 3-Rutinoside and Cyanidin 3-Rutinoside. Only a small number of species have been studied so it has been impossible to generalize on the pigments associated with flower color.

This report represents the initial phase of a study on flower color of *Amaryllis.* The objectives of this study were to identify the anthocyanins and characterize the pigments extracted from various species and hybrids. The ultimate goal of this project is to provide plant breeders with basic information on the inheritance of flower color.

MATERIALS AND METHODS

The plant material used in this study included various *Amaryllis* species or suspected species and various cultivars and seedlings from the Dutch hybrid group. Cultivars were selected to give a wide variation in petal color including red, pink, salmon, orange, purple, white, yellow, green and several blushes.

Chemical determinations for color were made using paper chromatography and with spectral analyses of the pigment solutions. The anthocyanins were extracted with methanol containing 1% HC1, band loaded on Whatman No. 1 chromatography paper and developed in two solvents. Solvents used for chromatography were n-butyl alcohol-acetic acid-water (BAW, 4:1: 5, by volume), and hydrochloric acid (1%). Absorption spectra for the anthocyanin solutions were determined with the Beckman DBG recording spectrophotometer. Flowers with yellow pigments were extracted with ethanol and the extracts were mixed with equal volumes of hexane and distilled water. Spectral data for the yellow extracts were determined as above.

RESULTS AND DISCUSSION

Two anthocyanin pigments were extracted from *Amaryllis* petals (cyanidin 3-rutinoside and pelargonidin 3-rutinoside). The chromatographic and spectral data for these pigments are shown in Table 1. Identifications were also made on the pigment extracts from at least forty other cultivars and only the pigments mentioned above have been observed.

TABLE 1. The anthocyanin flower pigments of various **Amaryllis** L. species and hybrids.

		Anthocyanins† present		
Cultivar or species	**Flower color**	**Polar-gonidin 3-Rutino-side**	**Cyanidin 3-Rutino-side**	**Absorb-ency peak**
Species				
A. belladonna L. (Doran 52)	rose	—	**	528
A. belladonna L. (Beckham)	bright red	**	*	517
A. reginae L. (Doran)	v. bright red	**	trace	513
A. blossfeldiae (Doran 32)	orange	***	—	512
Hybrids				
"Gracilis" (O'Rourke)	bright red	**	*	520
Dutch hybrids:				
White seedling (Beckham)	white	—	—	—
'Queen of the Pinks' (Ludwig)	pink	trace	*	527
'Siren' (Ludwig)	rose	trace	**	523
Ludwig's H-9	lt. pink	*	**	525
Ludwig's H-109	dark red	*	****	526
Beckham seedling A	dark red	***	***	520
'Minerva' (VM)††	red, white throat	***	*	515
Ludwig's H-32	dark orange	***	—	512
Ludwig's H-85	orange	****	*	516
'Adenda' (VM)	dark orange	***	—	512
Beckham seedling B	dark orange	****	trace	513

† The number of asterisk (*) signs is proportional to the amount of pigment present.
†† (VM) = VanMeeuwen.

The orange and pink bands produced by chromatographing the pigment extracts were used to calculate the Rf values (a ratio of the solvent front to the pigment front X 100) in Table 1. The bands produced from the pigments of one plant extract were identical to corresponding bands from other sources when developed in BAW or HC1 solvents. Likewise, the Rf values obtained from *Amaryllis* petals were very similar to those produced by chromatographing the cyanidin and pelargonidin compounds. Anthocyanins have a characteristic peak in the visible portion of the light spectra and the absorption maximum can be used to aid in pigment identification. The absorption maxima of the amaryllis pigments were very similar to those of the authentic compounds and further substantiated the identification made above.

A survey of the anthocyanin pigments in various *Amaryllis* species and Dutch hybrids is shown in Table 1. Pelargonidin 3-rutinoside was the most abundant pigment and was observed in the pigment extracts of most flower types. This pigment was associated with orange, salmon, and red flower colors. Cyanidin 3-rutinoside was the least abundant pigment and was frequently associated with pink, rose, ''purple'' or red flower colors. Most red flowers contained a mixture of the two anthocyanins in varying amounts. White flowers did not contain either of the two pigments.

The above data clearly indicate that several genes control the synthesis or modification of anthocyanin pigments in *Amaryllis.* For example, flowers of *A. belladonna* (Doran No. 52, Rose C type) contained only the cyanidin pigment, whereas, flower color in one species (*Amaryllis blossfeldiae* Traub & Doran, Doran No. 32; see PLANT LIFE 27. 1970) resulted from the presence of pelargonidin alone. Most flower color differences, however, appeared to result from quantitative differences in the two pigments. Indications are that white flower color is due to a suppressor gene, since crosses between white and red parents have not resulted in a predominance of red seedlings.

The pigments extracted from two yellow flower types (*A. evansiae* and an *A. evansiae* x *A. aglaiae* cross) were not anthocyanins. The yellow pigments were soluble in hexane and exhibited absorption spectra that are characteristic of the carotenoids. Thus, more than one class of pigments may add to the flower color of amaryllis.

In conclusion, the results of this study have shown that many breeding experiments will have to be conducted to completely elucidate the effects of various gene differences on flower color in amaryllis.

LITERATURE CITED

1. Harborne, J. B. 1967. Comparative Biochemistry of the Flavanoids. Academic Press. London and New York. 383 pages.

2. Traub, Hamilton P. & J. L. Doran, *Amaryllis blossfeldiae* sp. nov. PLANT LIFE 27: 88. 1971.

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AMARYLLIS BREEDING—1970 REPORT

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It would indeed be a pleasure for me to describe many new seedlings, but unfortunately they did not materialize during the 1970 season. It was simply not a good season for me; and the general consensus among other growers and hybridizers in this area leads to the same conclusion. My poor results in greenhouse culture was simply a matter of not achieving sufficient growth during the growing season. This was my own fault because I kept most of the plants in the greenhouse through the summer of 1969. With temperatures reaching 100 degrees and above (in spite of the exhaust fan and misting nozzle) *Amaryllis* species and hybrids do not make optimum growth. So I learned by this sad experience. In the spring of 1970 all my *Amaryllis* were placed outdoors such that they received 2-3 hours of morning sun. Most of the smaller pots were buried in bagasse (fibrous residue from processing sugar cane) to minimize moisture loss. This approach plus fertilizing at three week intervals has given the most luxurious foliage growth I have yet experienced. The anticipation is that the 1971 season will be far better than the 1970 season.

Very few new seedlings bloomed in 1970. The most interesting was a very small ribbon pink, about 2½ inches across. The parentage was *A. starkii* X [(*A evansiae* x *A. aglaiae*) x *A. evansiae*]. It was a true miniature but there is some question in my mind whether it will remain this small.

I had sufficient bloom among the older established species and hybrids to make more than fifty pollinations—and realize some half dozen seed pods for my efforts. But all represent interesting crosses some of which I have been attempting to set for several years. I obtained a good pod and almost complete germination of the cross *A. evansiae* x White Dutch Hybrid. The *A. evansiae* was the first bloom of a seedling bulb obtained several years ago from Mrs. Alek Korsakoff. The white Dutch in this case was supposedly 'White Giant', the pollen being obtained from Fred Buchmann since I had none available at the time. Fred later told me this white was self fertile and so was not 'White Giant'. The seedlings are vigorous growers. Previously I had attempted this cross with three different clones of *A. evansiae* and most of the named white Dutch hybrids, but always without success. So here again it was simply a matter of bringing together the right clones.

The same clone of *A. evansiae* was used as the pollen parent on *A. belladonna* x *A. striata*) and gave a large crop of vigorous seedlings. This cross had also been attempted previously, and without success. using other clones of *A. evansiae*. Different clones of the same species do behave differently in hybridizing.

I was also able to set seed with the pollen of the above mentioned White Dutch clone on the SA 63-20 X (*A. evansiae* x *A aglaiae*) hybrids which I have described previously. Similar pollinations attempted with the pollen of 'Nivalis' and 'White Christmas' were unsuccessful. Although the seed appeared to be good, germination was very poor, three from one pod and one from another. This has been the general experience in crossing white Dutch hybrids on these SA 63-20 hybrids. This might be indicative of a difference in ploidy level or some other type of chromosomal incompatibility.

Late in 1969 I received a shipment of *Amaryllis* bulbs from Dr. Martin Cardenas. There were six different *Amaryllis*, under number. Dr. Cardenas had the bulbs collected in the vicinity of Apolo, a remote area of Bolivia not frequently visited by collectors. This is the general locality where *A. viridiflora* is found. These bulbs were given as wide distribution as possible. Five of the bulbs (Nos. 2-6) are growing exceptionally well for me and I feel certain that some of these will bloom in 1971. One bulb (No. 1) was somewhat soft when received and was cultured very carefully. It has hardened up and made some leaf growth, though not as much as the others. I have every reason to believe that this group may contain some new species and I hope that next year I will be able to describe some of the blooms.

Both Fred Buchmann and I received bulbs collected by Dr. C. Gomez Ruppel. These included *A. aglaiae,* a form of *A. belladonna,* ''Red Cochuna'' and a ''brown Aulica'' as well as some of the interesting long trumpet species. These included *A. immaculata, A. elegans* var. ''albostriata'' and *A. elegans* var. ''Mrs. Sosa''. The latter is described as a pea green or chartreuse green self. The varieties ''albostriata'' and ''Mrs. Sosa'' have made very good growth during the one season I have grown them. Very recently I acquired from Dr. Ruppel *A. ambigua, A. angustifolia* and *A. ''yanellosianum''.*

A few comments are in order on the culture of *A. fosteri.* My large bulb retained its leaves through the spring of 1970 despite being maintained almost completely dry. Since midsummer I have watered it lightly, but there is no evidence of growth at this writing (early September). The bulb remains very firm. Two smaller bulbs which went dormant earlier than the large one each put up a single leaf in July. I suspect the larger bulb has not yet completely reversed its seasons. I note *A. fosteri* has a marked tendency to pull itself deep into the potting medium, much the same as *A. aglaiae.*

TRIALS OF AN AMARYLLIS SPECIES HYBRIDIZER

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Species hybridizing is not always easy and simple and sometimes the worst comes to pass. The hybrids arising from (a) 'White Christmas' x *A. yungacensis* (b) [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] x 'Maria Goretti' described in the 1970 Plant Life (page 108) have now been shown to be triploids, in the first case (or highly suspect as triploids, in the second case) by researchers at Louisiana State University as reported elsewhere in this volume (see *Amaryllis* Chromosome Studies, M. Burnham, et al.). This essentially eliminates using these hybrids as seed parents in future hybridizing programs. Although some success may be achieved using the pollen of these triploids, the ploidy of these potential offspring is somewhat in doubt and the future is not completely bright in this case either. The back cross using pollen from hybrids in case (b) above on the seed parent reported last year have given very weak seedlings which may take a very long time to come into flower and aneuploidy is suspected. The hybrids obtained from one of the crosses made by Joe Mertzweiller using pollen from (a) above are growing fairly well and we can be somewhat more hopeful in this case.

Based on the few simple experiments and data available thus far, some generalities may be reached as indicated in the following tabulation.

Seed Parent	**Pollen Parent**	**Chances for Viable Seed**	**Seedlings, If Any**
Tetraploid	Diploid	Very Low	Probably Triploid. Possibly Tetraploid.
Diploid	Tetraploid	Low	Maybe Aneuploid or Triploid.
Triploid	Diploid or Tetraploid	Near Zero	....
Diploid	Triploid	Low	Maybe Aneuploid.
Tetraploid	Triploid	Low	Maybe Tetraploid or Aneuploid.

However, these generalities are completely inadequate to explain some of the results that have been obtained. Four different clones of *A. evansiae* were pollinated on all florets with pollen from various white Dutch cultivars; three gave no viable seed at all, one made a seed pod with some viable seed for each pollination. Since the white Dutch are probably all tetraploids, is it possible that this one clone of *A. evansiae* is also tetraploid? This seems unlikely. But for some reason this one clone readily accepted white Dutch pollen and we must wait to see if the offspring are fertile also. In another series of experiments, pollen from *A. yungacensis* was used many times with various white Dutch and only the one seed pod and the four seedlings previously reported were forthcoming. This is easy to accept now that we know that *A. yungacensis* is diploid and the white Dutch are tetraploid. On the contrary, a large red Dutch, 'Tarakan', was pollinated on two florets with pollen from *A. yungacensis* and both gave large seed pods with many viable seed. Is 'Tarakan' diploid or are the seedlings triploids? Are all the current large flowered hybrids tetraploids?

To make hybridizing a bit more scientific, we should have more knowledge of chromosome complements. One of the parent plants that we would like to have is a large white flowered cultivar that is a diploid if such exists. This could be used with diploid species to increase size and improve form but preserve the color or color pattern of the species. Of course, we can use tetraploid species with the tetraploid white Dutch where this will produce something new or improved. This brings to mind a pot of seedlings from 'Maria Goretti' and pollen from a beautiful pink *A. belladonna* collected by Dr. Cardenas near Rurrenabaque, Bolivia. Will these be fertile or sterile? If fertile, they should lead to a line of pink hybrids in shades of pink not currently available.

After these trials and tribulations, the question arises as to what it is really necessary for an amateur hybridizer to know about the chromosome complements of his parent plants. Well, it would be nice to know the chromosome count of each one equally as well as we know color, size and form but this just is not very likely. A good microscope is required and, in addition, a great deal of skill, technique and time, of each of which the amateur may not have a sufficiency. We are extremely grateful for the work done at Louisiana State University, but their efforts may not be continued next year.

In the meantime we will have to struggle along making the best choices possible with the knowledge available. Possibly it is just as well for the amateur not to know all; otherwise many pollinations would not be attempted, some of which have a small chance of success and of producing attractive cultivars.

THE GROWING INTEREST IN SMALLER AMARYLLIS

V. Roger Fesmire

Perhaps it may be thought that the writer is referring solely to the miniature *Amaryllis* as classified under Division 8 by the American Amaryllis Society, but not so. The flowers also of the ''Belladonna'' type as classified under Division 3 are often somewhat smaller than the large-flowered hybrids; these are the flowers over 4″ in size which definitely exhibit species characteristics. Then there is the question of what to do with those flowers of Reginae and Leopoldii form which are under 6″ in size; in the Southern California Amaryllis Show, they have been classified under Division 9. Smaller flowers will also probably be found in the long-trumpet and the orchid-shaped types of Divisions 2 and 6, which have recently begun to attract some interest. In short, with the exception of the large Reginae and Leopoldii type of flower, most *Amaryllis* would fit into this category, yet they have been largely neglected over the years. What they lack in size is usually made up for by other characteristics, such as gracefulness, unusual colors, more variety in shape, etc. More and more *Amaryllis* fans are beginning to realize that this emphasis upon size has surely deprived us of many beautiful flowers. Over the past five years here in Southern California, the writer has noticed a definite increase in the interest shown in these smaller-flowered *Amaryllis*.

Where can bulbs be obtained? This is going to present a challenge to those who would grow them. Some types, such as the Dutch Gracilis hybrids, can be obtained very easily, but others will be more difficult. One should check to see what friends are growing, particularly among members of the local Amaryllis Society. Furthermore, considerable variety in flower type and color may often be found in large plantings of *Amaryllis*. However, the easiest way to acquire smaller-flowered *Amaryllis* is to raise them from seed, which may be purchased or secured by your own crosses. Bought seed is usually from Dutch hybrids, but even that will give some smaller flowers. More desirable results will be achieved, however, if the seed is from crosses involving the smaller-flowered hybrids and species. Every successful cross that the author has made, which involved a species as either seed or pollen parent, has produced flowers which fall into either Division 3, 8, or 9, and with a few exceptions, every cross involving the miniature and Belladonna-type hybrids has likewise produced flowers in these divisions.

CROSSES WITH SPECIES

Until coming to California five years ago, the writer had only three species to use in his *Amaryllis* breeding program: a variety of *A. aulica* secured from Holland, three forms of *A. striata,* and a bulb from India advertised as ''A. pardina''. Unfortunately, none of his crosses with *A. aulica* were ever successful, but almost all crosses with the other two species were successful. Out of 24 crosses made prior to 1965 with the three forms of *A. striata,* seeds were secured in 22 cases. However, judging by his experience with other species in the last five years, *A. striata* is certainly the easiest species with which to get results. A few of these crosses have never yet bloomed, but the majority have produced flowers which would be classified under Divisions 3 or 8. Some of the more attractive ones have been described in previous numbers of the Amaryllis Year Book. Many of these Striata hybrids were used in further breeding work when they bloomed, such as crosses number C17 and C18.

Cross No. C17 was made between *A. striata fulgida* and an unnamed South African grown clone which bore beautiful large flowers of a lavender rose. The attractive flowers from this cross varied in size from 4″ to 5½″, and every one was a different shade of pink or rose, but unfortunately these hybrids were very tender and all have perished. However, one of these pink hybrids was successfully crossed with another one, and the first bulb of this cross bloomed in 1969, with 5″ flowers of a beautiful crimson rose and a light green throat. This in turn was immediately crossed with another, more vigorous South African grown clone of identical color to that used in the original cross, and also with an unnamed Ludwig white Dutch clone which has a pronounced yellow cast to the flowers. Another of the original C17 clones was crossed with an orange-flowered Striata hybrid, which cross has given ruffled pink flowers with much light green in the throats. Still another C17 clone was crossed with an orange-red Striata hybrid (No. C18), which cross (C98) naturally gave flowers mainly in shades of red, but one clone was a beautiful rose with 4″ flowers. This has bloomed for three consecutive years, and this year had two scapes in bloom at the same time, as seen in Fig. 28. In these three years it has been crossed with 'Violetta', and with the *A. evansiae* x *aglaiae* x *evansiae* hybrid (which seedlings are growing exceptionally well), with another pink-flowered South African clone, and with another clone of the C98 cross. From all of the above crosses, the writer aims to develop a group of hybrids which will be between 4 and 5 inches in size, with graceful, ruffled flowers in various shades of pink to lavender, and which would be classified under Division 3 or 9.

Cross No. C18 was made between a scarlet-flowered Indian miniature and *A. striata fulgida.* These flowers showed considerable variation in size and form, but very little in color, which was an orange red. They were very attractive, but also were quite tender. One of these clones was crossed in 1964 with the species purchased as ''A. pardina'', and the first two bulbs to flower of this cross (No. C89) just bloomed in 1970. The flowers were only about 3½″ in diameter, with reflexed and ruffled segments, which were a scarlet red in color with darker red veining and a light green throat. The scapes were only about 6″ tall and the leaves are also rather small; so this cross made a very attractive addition to the writer's growing collection of miniature *Amaryllis*. (See Fig 28-A.)

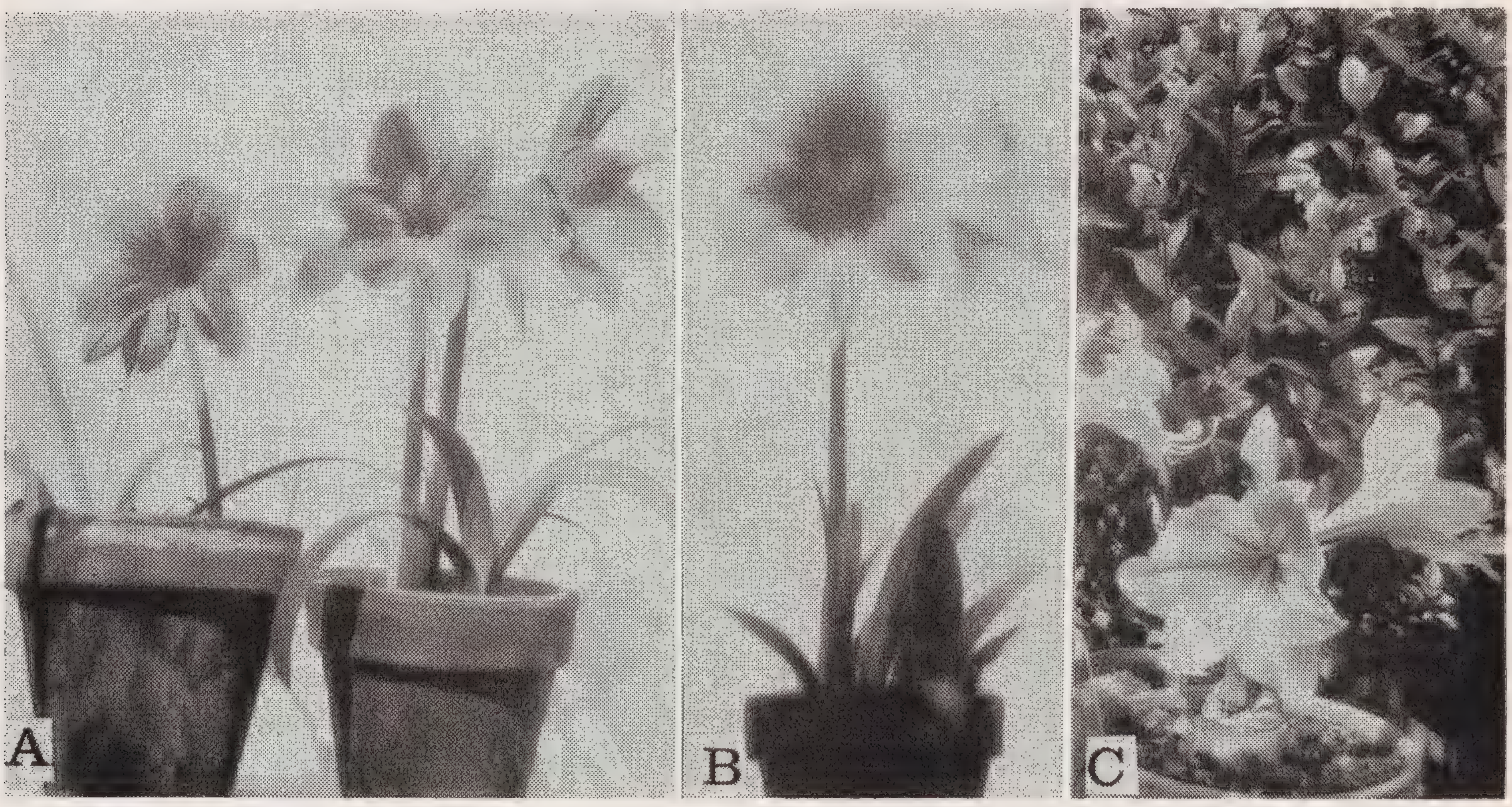

Fig 28. Fesmire Amaryllis crosses: (A), cross No. 89, left; cross No. 98, right; (B) No. C 172, 4½″ white, pink & green flower; and (C) **A. aulica** cross.

In the past four years, successful crosses have been made with the following species (usually as the pollen parent): *A. petiolata* (argilagae), a bulb received as "A. aulica robustum" (but which may be *A. moreliana*), a white form of *A. belladonna, A. evansiae, A. psittacina, A. reginae, A. starkii, A. vittata,* and Goedert's No. SA65-23. When these seedlings reach blooming size, they should produce miniature or Belladonna-type flowers. Nothing but failures have been recorded when using pollen from *A. aglaiae,* other forms of *A. belladonna, A. elegans, A. forgetii, A. fosteri, A. miniata,* "Mrs. Sosa", "Orange Reitz", *A. papilio,* "Red Cochuna", *A. reticulata,* and several yellow-flowered long trumpet species from Argentina. However, thru the generosity of friends, seeds or bulbs of crosses involving 16 different species have been received, including: *A. immaculata, A. aglaiae, A. cybister, A. correienesis, A. fragrantissima,* and SA66-27.

In January of 1969, the writer received from a friend in Pasadena seven blooming size bulbs of a cross between *A. aulica platypetala* and the named clone "New Orleans". These bulbs had been growing in the ground, but had to be dug and removed from that site in the fall of 1968; so after being kept in dry storage until January, they were finally potted up. They began to grow at once and three of them promptly bloomed with very attractive flowers, which averaged 5″ in size. (Fig. 28-C) Two of them had a white background overlaid with red markings, plus a green throat, while the third was a beautiful pink with much green in the throat. By July of this year, these bulbs were just starting to grow again; so hopefully they may be late summer or fall bloomers.

CROSSES WITH SMALLER-FLOWERED HYBRIDS

Crosses made with species are one source of smaller flowers, but crosses made with the smaller-flowered hybrids now in circulation are still another and easier source. The writer once had some bulbs of the Houdyshel orange-scarlet hybrids (while living in Colorado), which he used in many crosses, producing flowers that he called "windowsill hybrids" (See 1969 Year Book). Actually, these were mainly Reginae or Leopoldii type flowers that were less than 6″ in size, and so belonged in Division 9. There is also a red and white *Amaryllis* commonly grown outside in the ground here in Southern California which is a very cold-resistant and vigorous grower. This has been used in a number of crosses with the idea of securing hardier forms of *Amaryllis,* but the seedlings will undoubtedly bear flowers under 6″ in size. It has been crossed with various Dutch hybrids, some of the author's Striata hybrids, the Peruvian Miniatures, and the Senorita hybrid, but none have bloomed yet. Rather curiously, pollen from one of Quinn Buck's Calyptrata hybrids was used on this red and white *Amaryllis* in 1967; three flowers were pollinated and all three produced seed. Now these seedlings are growing very well, although the leaves are very narrow.

In 1966 the writer mixed the pollen of the South African clone 'Tangerine' with pollen from a Ludwig seedling which bore small white flowers strongly tinged a greenish yellow. This pollen was used on a white-flowered "Australian" hybrid which also had a tinge of yellow. The first two seedlings to bloom of this cross (No. C172) produced Leopoldii type flowers, but since they were under 6″ in size, they must be entered under Division 9. One was a 5″ flower of orange scarlet with a green throat, and on each segment was a white stripe speckled and edged in dark red. Although the other was slightly smaller, it was my favorite color combination: a beautiful white flushed pink, with considerable green in the throat and green on the tips of each segment (Fig. 28-B).

Two other crosses with 'Tangerine' have also produced smaller flowers. The first bulb to bloom of a 'Tangerine' by White Dutch cross had 5″ flowers of excellent form and color; they were a vivid pure scarlet with no markings, except that the throat was a darker red. The other cross was between 'Tangerine' and the author's orange-scarlet Striata hybrid No. C18; this also bloomed with 5″ flowers of a deep scarlet, but the throat was a light green edged crimson. In this cross, the species influence was quite apparent, since the segs were both reflexed and twisted, and the flower drooped; despite this characteristic, it was an attractive Belladonna-type flower.

This writer aims to develop many more of these smaller-flowered hybrids, with the emphasis upon pastel colors and ruffled segs. He has had to do considerable experimenting with soil mixtures and growing procedures in the past few years since moving here to California, but hopefully the difficulties have been overcome so that ''production'' can now be increased. If others would work on developing long trumpet and orchid-shaped hybrids, the day will come eventually when every type of Amaryllis will be represented in both flower show and bulb catalogue.

AMARYLLIS IN AUSTRALIA

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Twelve years ago I happened to be in Town and looking at plants in a chain store I noticed some large bulbs. The sales girl told me they were *Amaryllis* (syn.—*Hippeastrum*). I bought one for 30 cents. Little did I know that it was to be the start of a wonderful hobby. I potted the bulb in ordinary sandy loam from the garden. After four to six weeks a flower bud started to appear and it reached a height of eighteen inches before the sheath burst open, revealing four reddish coloured flower buds. When the flowers eventually opened I was amazed at their beauty. Nice scarlet colour with a greenish throat. I still have the bulb and many of its offsets have flowered for me. It was really a lucky day when I decided to walk into that chain store.

Not knowing how to care for *Amaryllis* I decided to see if I could find some literature, so visiting a bookstore I purchased ''Amaryllis and How to Grow Them'' by Peggy Schulz. I then found out that they belonged to the Amaryllis Family. I found a list of growers in the book and from Ludwig and Co. I obtained a catalogue. I purchased a large number of clones and I had notification from the Department of Agriculture that they were in quarantine at the Botanical Gardens. A couple of months later I visited the gardens to inspect the bulbs and most of them were in flower. They were really beautiful and the flowers and bulbs were so large. After a few months they were released from quarantine and when the following spring arrived I was so eager to see them in flower again, but to my surprise only a few had blooms and I also discovered the bulbs were shrinking. A few varieties I lost so I repotted the remainder in a mixture of sandy loam, leaf mould and cow manure. They put on growth yet at the end of the growing season the bulbs did not seem to be any larger.

It was by chance I had gone to visit our Agriculture Show and in the plant section a grower from the Blue Dandenong Bulb Farm had a large display of *Amaryllis* in flower. I asked him many questions and told him how my bulbs were shrinking instead of getting larger and he was surprised when I said I had them in pots from year to year. He advised me to put them in the garden. A week later I prepared a bed and dug in large quantities of cow manure. I took the bulbs out of the pots and planted them with the neck above the soil. At the moment I am lifting the bulbs and repotting them. They are nice and solid and they are larger and some have offsets.

Looking back to my first purchase twelve years ago I can say I have had success and failure yet I have gained a lot in experience. The lessons I have learned are (1) amaryllis are heavy feeders (2) they need a rich, well drained compost with plenty of manure (3) be very careful with the watering can in the early stages of growth (4) don't spill any water in the neck of the bulb or it may cause rot (5) plant the bulbs in the garden after flowering.

This year I am trying a few bulbs in a mixture of leaf mould, cow manure and coarse sand and I shall make notes on how they grow.

I cross pollinate most of my flowers and have full seed pods. When the seed are ripe I sow them in boxes 18 inches by 14 inches by 4 inches in depth using a mixture of coarse sand, leaf mould and sandy loam. I steam sterilize the mixture. I leave the seedlings in the trays for two years, feeding them with a soluble fertilizer mixed in water. I then plant them in individual pots or six to eight in a large pot. They stay in the pots until they flower and I rogue out any that don't come up to my standard. The remainder I plant in the garden. I do find that when I take seed from a variety it usually does not flower the following year. I have decided the bulb needs a special feeding programme to build up its strength and that usually takes a year. I also believe that is the reason so many people are disappointed when they buy a bulb and it fails to flower the following year. They don't realize that they have to feed the bulb and keep it nice and plump.

Pests are very few. The bulbs in the garden may be troubled with a few snails and slugs. I don't use baits. I find that going into the garden at night with a torch one can pick them off the leaves and a size 9 boot will despatch them very quickly. In the greenhouse I have to watch for mealybug which can be troublesome.

Propagation. I have cut wedges in the base of a few of the bulbs and I obtained offsets. The varieties were 'Apple Blossom', 'Candy Cane' and 'White Witch'. With some of my seedlings I have been surprised to have offsets appearing normally when the bulb is only about eighteen months old. Some have had nine to ten offsets. Has any other member experienced this? As they have not flowered I am keeping my fingers crossed and am hoping the flower is a good one. I have not tried scaling the bulbs like the large growers in Holland do. I would appreciate any information on how to do this.

As I only grow hybrids I have read with great interest about the species of *Amaryllis* that Peggy Schulz talks about in her book. Most of these are unobtainable in Australia. I have written to most of the addresses listed in the book. Mr. W. Hayward forwarded my letter

BLEAKLEY—AMARYLLIS IN AUSTRALIA—continued on page 132.

4. AMARYLLID CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

YEAR ROUND AMARYLLID BLOOM IN LIMITED SPACE

WILLIAM R. ADEE, *916 Sunset Avenue,*
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For a year I have had almost constant blooming of *Amaryllis* in a four foot by twelve feet lean-to greenhouse. Among the factors which made this possible were reblooming species and species hybrids, bulbs newly acquired from the wild, and species and hybrids that naturally flower in off seasons. I have not purposely manipulated the dormant periods of these bulbs but have dried off those which are ready to rest according to their growth patterns.

Amaryllis belladonna (Equestre) x *evansiae,* Senorita, Green Senorita, *A. belladonna* var. *haywardii* x *striata,* and *A. striata* blossom two and three times a year. This group is evergreen, small, attractive, easily managed and useful as house plants.

Dormant bulbs received from foreign collectors will often blossom as soon as received. A bulb received as *A. apertispatha* blossomed in late October on its arrival from Argentine. It started a bud as soon as it was planted. A red flowered species from Brazil flowered in late June and again in July with two scapes with two flowers on each.

Species that blossom naturally at odd times extended the flowering over the entire year. A small salmon *A. belladonna* collected by Mr. Len Doran, his number 14, flowered in June. The ''Holtville Amaryllis'' received from Mrs. Frank McCown blossomed in early August. Various *A. evansiae* have flowered in December and January. *A. starkii* blossomed in early February. Another species, a beautiful white with one-half inch of red veining all around a regular shaped flower opened in late February. March brought flowers from two handsome seedlings of a picotee Peruvian miniature x *A. striata.* Mr. Doran's *A. reginae,* numbered 10, sent forth two species of three flowers each in April and May. His *A. striata* number twenty-five and a Blossfeld number thirty-three, both attractive small plants, flowered at the same time as *A. reginae.*

I did not expect any flowers in the summer because of the tremendous heat in the greenhouse, but a yellow trumpet Argentine miniature sent up two scapes in July. A handsome white miniature with magenta-rose markings hybridized by Mrs. Flores Foster, using Howard & Smith purple x white Dutch, blossomed for the first time in July. Another of Dr. Carlos Gomez Ruppel's Argentine imports, a white trumpet which he calls ''albostriata'' flowered just after the yellow one.

I do not raise many named Dutch varieties preferring to use my limited space for the more varied possibilities of the species and their hybrids.

I am interested in other amaryllids and have been fortunate to see some of them blossom this year. *Clivia caulescens* and *C. nobilis* blossomed this spring and summer. Nobilis' thirty flowers lasted over a long period. *Cyrtanthus* have not been generous with bloom. A ''Stenomesson''(?) received from Mrs. Elizabeth Naundorf of Ecuador blossomed in June for the second year. *Nerine filifolia* is a dependable bloomer in September. *N. undulata,* not so dependable, blossoms at the same time. Late July and August brought flowers of *Pancratium maritinum. Phadramassa chloracra spectabilis* is now in bud in late August.

HYBRIDIZING ACTIVITIES

I have seedlings that are the result of other hybridizers' activity but will list a few of my own successful attempts: *A. apertispatha* x mixed pollen of *A. calyptrata* and *A.* ''Holtville clone'', (*A. belladonna* var. *haywardi* x *striata*) x various mixed pollens, *A. evansiae* x *A. apertispatha,* Argentine trumpet miniature yellow x *A. elegans* var. *elegans,* the same yellow trumpet x *viridiflora,* yellow trumpet x a larger yellow Argentine trumpet, (picoteed Peruvian miniature x *A. striata fulgida*) x the a white species with one-half inch border of red veining, *A. reginae* x *A. fosteri,* Senorita x *A. apertispatha, A. starkii* x Mr. Doran's rose pink *A. belladonna* miniature number fifty-two, *A. striata fulgida* x *A. apertispatha,* and 'Zenith' x Mr. Doran's beautiful pink and white double hybrid.

The *A. apertispatha* from Argentine was a very potent pollen parent, ''taking'' on almost every cross I tried. I sent pollen to several people who reported similar successes. The yellow Argentine trumpet miniature was an outstanding pod parent making four pods from five pollens. I'm sure there would have been five pods had the fifth pollen been fresh. The pollens used were from various trumpet types.

I try to keep in constant communication with persons of similar interest in order to know what pollen will be available at any time and in order to supply pollen to others. Resulting seeds are distributed among our group of correspondents. Pollen is stored in a jar in the refrigerator with dessicator capsules that extend its usefulness over a long period. The dessicator capsules may be had from your friendly pharmacist, if he will give you the ones from his wholesale vitamin pill bottles.

Whenever I find a bud started, I bring the plant into the house from the greenhouse until it has flowered, has been pollinated, and the pod started.

Last spring I changed potting mediums from dirt to sphagnum moss. This has led to improved growing under my conditions for *Amaryllis, Cyrtanthus* and nerines, but led to decline in clivias. I prefer to plant seeds in soil having found that Sphagnum held too much moisture for newly germinated seeds and led to the loss of some particularly treasured crosses. I do not soak seeds for more than twenty-four hours before planting them, although I know that others have success with longer periods of soaking and floating on water.

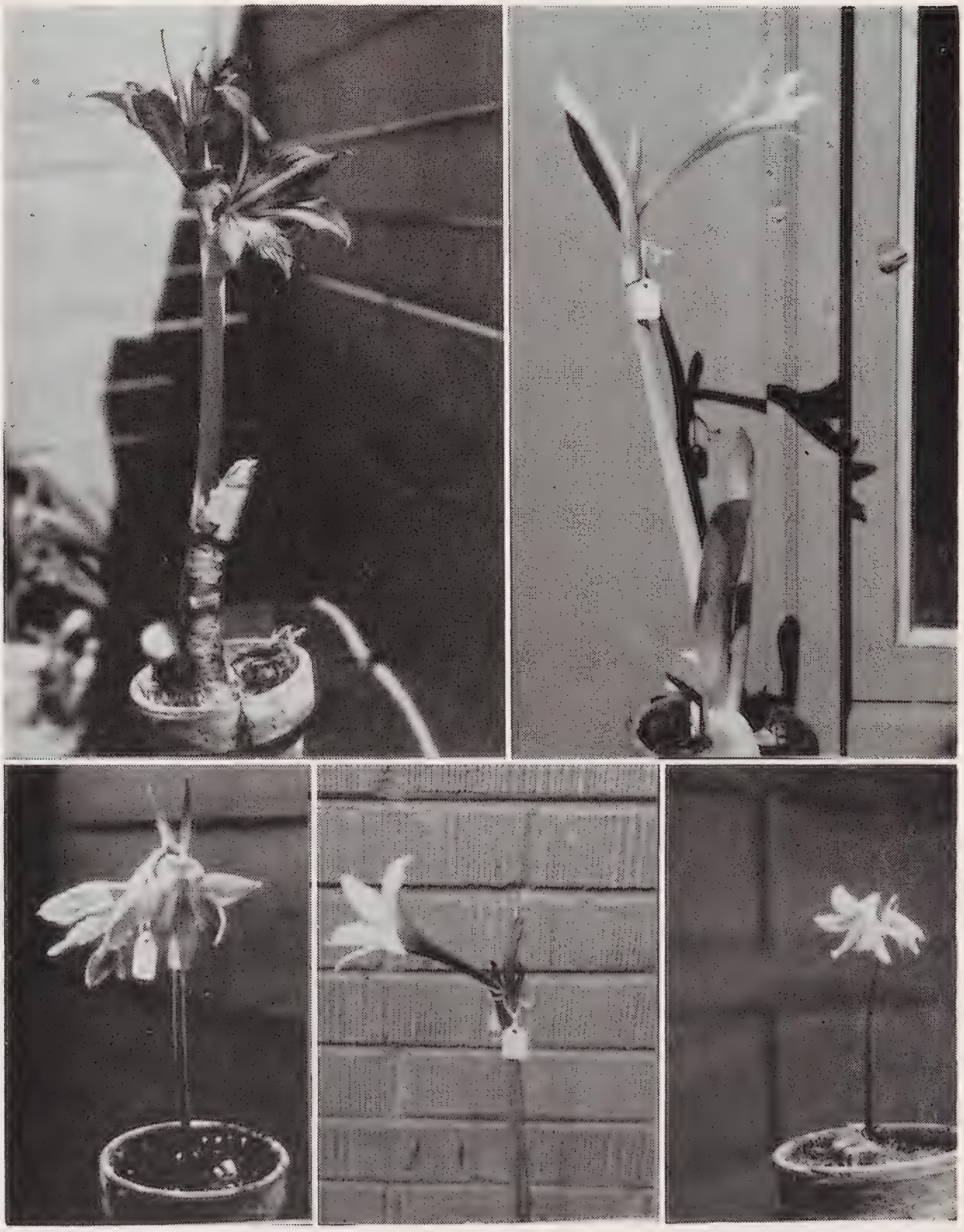

Fig. 29. Amaryllis flowered by Mr. Adee: **Upper left,** a Brasilian red species imported by Hugh Bush, flowered in 1970; **Upper right,** A yellow trumpet miniature species from Argentina, collected by Dr. Ruppel; flowered in 1970; **Bottom left, Amaryllis apertispatha** from Dr. Ruppel; **Bottom middle,** "A. albostriata" from Dr. Ruppel, flowered in 1970; and **Bottom right, Amaryllis blumenavia,** flowered in 1969.

Mealybugs are not a problem under my growing conditions but mites are. The mites enjoy aulicas more than they do the others and I have yet to find a satisfactory control.

GOALS

My goal is to learn to grow these plants efficiently to blooming size, develop more rebloomers, discover new flower forms, colors, and patterns through hybridizing with species *Amaryllis.* I am interested in flowering and hybridizing *Haemanthus, Clivia,* nerines, and *Lycoris.* I have imported hybrid nerines from England this summer in the hope of getting a more free flowering type. I have the small *N. filifolia* and *N. filamentosa* to use in breeding for small types. I have not been so fortunate in getting the big tetraploid ones.

My *Lycoris* collection includes many species but I have not had them long enough to know much about their growth and flowering habits. *Lycoris sprengeri* grows and blossoms nicely out of doors in northern Illinois. The others are grown in pots.

In August 1969 I visited southern California where I first saw *Haemanthus* in flower. Since then I have added fourteen different kinds to my collection and am looking forward to learning about the growth habits of this odd-looking group.

Cyrtanthus have been a disappointment. I have many kinds but only a few flower each year. They have grown better since they were repotted into sphagnum and plastic pots. I recently acquired *Cyrtanthus obliquus* which was reported to be difficult. The report was not incorrect.

Although they are large I like the clivias very much and raise many types for hybridizing. They are not very demanding except for space. In summer they are kept outdoors in the shade of a high fence with frequent sprinklings with the hose. Some have flowered with various orange, red-orange, yellow-orange, and greenish tubular flowers. The leaves of a white striated leaf Belgian hybrid is particularly nice. A generous friend sent pollen of his yellow *Clivia* and seeds appear to be setting as the result of these pollinations. I have had better luck with *Clivia* by wintering them in a dry basement with some light from florescent lights than by keeping them in my greenhouse.

ACKNOWLEDGMENTS

It would be impossible to make a collection such as mine from commercial sources alone, without the kindness and generosity of other plant collectors and hobbyists most of this plant material would be completely unobtainable. Therefore I am most grateful to Mrs. Flores Foster, Prof. Hugh Bush, Mr. Roger Fesmire, Dr. Carlos Gomez Ruppel, Mr. Len Doran, Mr. Alek Korsakoff, Mr. Russell Manning, Mr. Les Hannibal, Mr. Paul H. William, Jr., Mrs. Mary Jeane Forberg, Dr. Hamilton P. Traub, Mr. Sherman Beahm, Mr. Sterling Harshbarger, Dr. Phillip Corliss, Mr. Joseph Mertzweiller, Mrs. Frank McCown, and the United States Plant Introduction Station, for their generosity with bulbs, pollen, seeds, and sharing of information.

A LONG-LIVED AMARYLLIS HYBRID

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These few comments on my experience in growing amaryllis are stimulated by and in response to Robert D. Goedert's fine article ''Amaryllis Season 1969'' Plant Life vol. 26. In his article Mr. Goedert stated he received many reports that the bulbs of commercially imported large-flowered amaryllis usually degenerate shortly. He further stated that the plant's culture is not really easy, hence the price of $5.00 per bulb.

This is the brief record of three amaryllis, one of which has apparently escaped the short-life syndrome and has flowered well for the last six years. In mid-November 1964 I responded to the beautiful pictures of Van Meeuwen's Superisosa strain in our local seed store and purchased one bulb of ''Paradise'' white. During the following two weeks I purchased two more, a ''Paradise'' scarlet and a ''Paradise'' salmon for possible Christmas gifts.

Never having grown amaryllis before, I first carefully read the planting directions received with the bulbs. On November 30, 1964 the bulb of the scarlet-flowered form was given the preplanting treatment recommended by the grower. On December 16th the plant had its first flower open, but no leaves. By December 23rd there were four flowers open on one umbel and a second umbel was developing nicely, but still there were no leaves showing. The plant was given away at this time and, I recently learned, it had a very short life.

The first flower on the second umbel of the salmon-flowered plant opened 38 days after the preplanting treatment was started, but no leaves had yet appeared. In September 1965 this plant stopped growing and did not respond to fertilization—it had lost its roots. All soil was removed, the bulb base dusted with Captan, and the plant repotted. By November it was in flower again. The plant made a nice gift in January 1966. It died a year or so later.

Both the scarlet and salmon-flowered bulbs were given the same initial treatment as the white-flowered form (described below) except for the hot bed treatment. Probably the starting temperature on the salmon and scarlet forms was a little too high, as two umbels developed and flowered entirely from reserve plant food contained in the bulb. The lack of leaves at the first flowering was a disappointment and contrary to the pictures on the grower's instruction sheet.

The following are notes recorded on the ''Paradise'' white plant, the longest lived of the three:

11-21-64—Put lower ¼ of bulb in water to soak.

11-26-64—Planted in 6″ pot in a modified U.C. Mix (Canadian peatmoss, #30 crystal white sand, and coarse Sponge Rok in the ratio of 4:4:1, plus one of the balanced inorganic fertilizers recommended for the U.C. Mix) and sank the pot in the hot bed (in the lath house) with the temperature set for 70° F. (It was the warmest spot available at the time.)

12-1-64—Hot bed a mistake; too moist and not warm enough, was only 68° F. Moved to hot house and set on bench directly over floor heater.

12-16-64—Apparently it was the hot bed treatment that rotted the umbel; two leaves are about 3″ long.

1-2-65—Second umbel coming nicely; two leaves about 5″ long.

6-18-65—One umbel well developed.

7-1-65—One ''double'' flower open today; is actually two flowers with connate pedicels. Very pretty. (Note: this flower abnormality did not occur again.)

7-23-65—Last flower fading.

9—65—In flower again. A beautiful plant.

1-28-66—New umbel showing.

2-16-66—First flower open; plant in hot house.

6-18-66—First flower open; plant in lath house the last three months.

8-12-66—First flower open, five per umbel.

6-26-67—One umbel just finished and two others now open. The plant has split its tub (12″ or 14″ cymbidium tub) needs a 16″ or 18″ tub. A most satisfactory tub specimen. Gave plant to Paul T. Emery, my father, who lives in North Hollywood, California. (Note: this area is inland from the coast and subject to considerable frost in winter as well as high temperatures in summer.)

The record is unfortunately brief, but the plant was just wonderful. During the period from November 1964 to June 1967 it was moved back into the hot house at least one winter. It was fed rather often with a balanced commercial fertilizer as I am apt to force plants at first to see how they will react. The amaryllis forced nicely, as shown by the two to three flowering periods in 1965 and 1966. It remained fully evergreen for the two and one half years and was attractive as a tub specimen both in and out of flower. No seed was allowed to develop during that period.

After receiving the plant, my father commented each year on how well it was doing, how many flower clusters it had, and the flower size.

In May 1970 I asked him for a few comments on his culture of the plant and he sent me the following notes:

White Amaryllis: Placed the plant, three unseparated bulbs, in 16″ diameter redwood tub under mulberry tree which allows sun in winter and full shade in summer except for about three-quarters of an hour in late afternoon. Rather heavy application of a balanced fertilizer twice a year. Bulbs have multiplied until top of tub is covered except for a few inches at several places around edges. Kept damp but not wet. Sandy loam, drains well. Some leaves stay all winter; blooms in late April and May. This year had 36 umbels showing at once. Each one with two to four flowers five to seven inches across, white with green throat and center stripe blending to white over all.

Due to my lack of experience with amaryllis, I do not know if the above plant is unusual or not. It would be interesting to hear, through

PLANT LIFE, from other members who have large, long-lived amaryllis that bloom so profusely.

EXPERIENCES WITH AMARYLLIDS

Hugh L. Bush, *109 East 33rd Street,*
Kansas City, Missouri 64111

Since writing my brief article for Plant Life, 1970, many new and wonderful things have happened. *Amaryllis* species and hybrids have bloomed, additional bulbs have been received and distributed, and new and interesting friends have been made.

With a little help from my friends—indeed, much help—I have acquired many additional *Amaryllis* species and hybrids, *Lycoris* species, and several huge blooming size bulbs of *Worsleya rayneri.* Wherever possible, these were shared with others interested in the amaryllids. My *Crinum* species and hybrids now number well over 100, all growing and blooming well in huge clay pots. Three of these, new to me and very exciting, are tremendous bulbs of *C. angustifolium* (the ''Queen Emma Lily''), the purple-bronze leaved *C. procerum* var. *splendens* and the ''Golden Crinum,'' a new species, all from Hawaii. These came as a gift from a very wonderful *Crinum* enthusiast whose name I am not at liberty to mention. Others of interest are two from Argentina, one purported to be ''purple'', the other a ''large white,'' and from Brasil a fairly large bulb collected as a ''pink *amaryllis,*'' but obviously a *Crinum.* Perhaps it will have pink blooms.

Several *Amaryllis* species received from South America have already been reviewed by others, but one of particular interest, collected in the Organ Mountains area of Brazil and sent as a ''red-flowered *Amaryllis* with green white-striped leaves'' was not red at all. Three of these bulbs distributed to friends have not yet bloomed but the bulb which I planted produced a single eleven-inch scape with four very lovely 2½″x4″ blooms of *white* heavily netted and veined inside, the top portions with rose-madder, giving a definite appearance of lavender in the early stages of flowering. The lower portions of the blooms are almost pure white. The spathe-valves are pink, tipped with a beautiful emerald green, the ovaries are pink. Using my brief descriptive notes and color film, our Editor has identified this clone as a ''fine specimen of *A. reticulata,* var. *striatafolia.''* Unfortunately, self-pollination produced no seed. A very robust-growing red-flowered *Amaryllis* from the same area performed excellently. Two bulbs which were distributed have bloomed, one has not. Hopefully, this *Amaryllis* will be described elsewhere in this issue by Prof. William Adee.

Approximately thirty select clones of hybrid Dutch and African grown *Amaryllis* grew and flowered beautifully under the ''Gro-Lux'' fluorescent lights. These were received here during prolonged periods of extreme cold and freezing weather and did not take too kindly to setting seed, although a few did produce fairly well. These seed, along with various others from friends, have produced literally thousands of interesting seedlings.

A dozen or more pots of interesting *Lycoris* species and hybrids grew extremely well during the winter under fluorescent lights placed in the coolest area I could find in my basement. Sufficient time was not available to allow planting these outside in the cold frame.

Again, the *Lycoris squamigera*, growing in an outdoor bed, has outdone itself in a glorious display of blooms; needless to say, the *Hemerocallis* and *Iris* have done likewise.

The tornadoes, so prevalent in this area, mercifully spared us until late summer when a mild one came our way and picked up my potted *Amaryllis psittacina* which had developed two fine ten-inch scapes and dumped it upside down, smashing foliage and scapes into smithereens. This heartbreaking experience is ameliorated somewhat by the excitement of thirty or more 6-inch long, slender, deep wine-red buds emerging from the scape on the large *Crinum angustifolium.*

Space will not permit listing names of all the wonderful *Amaryllis* enthusiasts who assisted in my endeavors, but I hope our Editor will permit this small note:—I would be greatly remiss if I did not express my appreciation and gratitude to all who so generously shared plant material, seed, pollen, and growing notes with me, and who have shown great patience and understanding when business pressures usurped my time to such extent that prompt attention to their correspondence was not always possible. Indeed, I do thank you and am sincerely grateful to you.

AMARYLLIS CYBISTER

During the summer of 1969, the writer received from his good friend, Alek Korsakoff, a two-inch diameter bulb of *Amaryllis cybister.* This clone is one received from Dr. Martin Cardenas of Bolivia by the late Prof. Claude W. Davis and distributed by him in October, 1965.

Placed alongside a stone wall where it received only morning sun, the bulb grew well in a four-inch pot of very porous, well-drained mix which was not allowed to dry out completely at any time. Weekly feedings of soluble plant food in diluted solution were given. When outside temperatures became uncomfortably cool in the fall, the plant was placed inside under ''Gro-Lux'' fluorescent lights with temperature range from 65° F at night to 73° daytime. Growth continued until January, 1970, when signs of beginning dormancy were noted. Water was withheld gradually until February 1st, then discontinued. In late February a scape emerged from the bulb and watering was resumed.

On March 10, 1970, four of the five curiously fascinating florets were fully open simultaneously in an eight-inch umbel atop a 24-inch scape. Two days later the 5th floret opened. New foliage appeared on March 20th and this bulb is growing well. This clone appears to be identical to the one described by Mr. W. Quinn Buck in *Plant Life,* 1965. Full credit for the flowering of this interesting species *Amaryllis* must be given to the good culture given it by the writer's friend during the four years he owned it. In order to preserve as much as possible the strength of the bulb, no attempt at self-pollination was made.

1970 DAYLILY SEASON REPORT

W. QUINN BUCK, *Chairman, Daylily Committee,*
American Plant Life Society

Two important things stand out in our retrospective study of the year 1970: the first is the really remarkable number of botanical and scientific papers on the *Hemerocallis* that have appeared in THE HEMEROCALLIS JOURNAL; the second is the reminder that rain and favorable weather are all-important to the breeder and the home gardener alike. 1970 was marked by unusually long dry spells over much of some of the most important daylily growing areas in the country, even the Atlanta convention being adversely affected. Florida, Georgia, Ohio, and Tennessee were especially dry, according to reports received, and hybridizers in these states were badly hurt by the hot, dry weather.

In the Midwest good seasons were reported for Orville Fay, Bro. Charles, James E. Marsh, Clarence Blocher, and others. Mr. Marsh showed further progress in his lavenders and purples, which had been most outstanding in 1969. The Blocher seedlings made an unusually fine show, especially in crosses involving 'Caption' (Griesbach); there were some outstanding pinks and lavenders among these. Mr. Blocher also flowered a satisfying number of good seedlings in other colors such as rose, purple, and red.

Wm. R. Munson, Jr., in Florida flowered a good number of new seedlings of real merit, even though plagued by a dry season that forced him to water the seedling beds with overhead sprinklers to keep them growing—and alive, even.

From Ohio came reports of quite amazing color progress in the work of Steve Moldovan, who had a strenuous year following his illness in the winter of '69-'70. His work in treating diploids with colchicine is beginning to show important results. Similar results should reward the amazing energy with which Dr. Virginia L. Peck has been polyploidizing diploid clones in her greenhouse where she formerly treated and grew-on germinating seed.

Dr. Peck's 'Satin Silk', a wonderful dark pink with yellow throat, was the finest new pink tetraploid used in the Buck garden for hybridizing in 1970. It was combined with many of the finest tetraploids, and in addition it was successfully crossed with treated plants of such clones as 'Frances Fay', 'Fountainhead', 'Sunset Sails', 'Pink Fluff', 'Lavender Parade', 'Curls', 'Rachel', 'Summer Splendor', 'White Jade', 'Louise Russell', 'George Cunningham', 'Pink Superior', 'Pink Darling', and 'May Hall'.

'Tai-Pan' (Moldovan), which has proved to be the best lavender-purple yet grown in my Arcadia garden, has been treated and re-treated, and it again produced seed freely. As a pollen parent it was used on treated plants of 'Peacock Alley' (Wynne) and 'Dorothy Lambert' (Lambert). The latter a clear lavender with a large pale yellow throat, was very fine when our weather was favorable. 'Tai-Pan' has the admirable quality of not varying so much because of weather fluctuations.

'Scarborough Fair', 'Empress Mei Ling', and 'Domani' were the best performers among the tetraploids from R. W. Munson, Jr., during 1970. His 'Secret Garden' and 'Milanese' lost much of their color quality on hot days. Treated plants of 'Vivacious', 'Jimmy Kilpatrick', and 'Fountainhead' were much enhanced in color, the latter becoming an extremely beautiful thing. The pink 'Mary Read Rosa' was a lovely diploid from this grower, showing clear color and fine shape.

The Greisbach tetraploids in 1970 reacted unevenly to our California weather, some being disappointing in quality and performance. 'Arriba' showed more sunfastness than is normal for this dark red, while 'Vivid Paint' sunburned severely. The lovely melon 'Adela' was a superb pod parent, being matched in this only by 'Seed Setter' (Hardy).

Some other treated clones of exceptional promise were 'Charlemagne' (Moldovan), quite outstanding in color; 'Sholom' (MacMillan); 'Presiden Giles' (MacMillan); 'Annie Welch' (Claar) and 'Prairie Moonlight' (Marsh).

Among the new Buck tetraploid seedlings were several pinks, and an exceptional large pale yellow with wide lighter midrib. One of the finest new tetraploids grown was 'Golden Ring' (Traub). Dr. Traub's ''masterpiece'' is to be released in 1971 or 1972, and it has exceptionally good multiple branching to recommend it, besides the fine quality of the flowers.

We daylily growers again in 1970 had a happy season with our plants, in spite of all unfavorable factors, and we are already looking forward to another year.

EXPERIENCES WITH AMARYLLIS AND OTHER AMARYLLIDS

Richard E. Tisch, *20516 Clark Street,*
Woodland Hills, California 91364

General. This past year has been sprinkled with surprises, mainly pleasant. Procedures on which full reliance had been placed resulted in advances beyond expectations. The rapidity with which improvement occurred was in some cases startling. The margin of maturation of plants grown in plastic juice pitchers over that of plants grown in standard clay pots was even greater than in previous years. By now there were also enough plants in square plastic pots, from 3-inch up to 6-inch square, to note that they, too, matured faster than plants in clay pots. Also, seedlings which were carefully spaced in their original plastic dishpans could be grown on to final transplanting size without shifting up through a series of gradually larger pots, and they matured before plants which had been shifted up via several transplantings. Had I the space, I would be tempted to grow plants on from seeds sown directly into deep beds or pans, with no transplanting until after they produce their first flowers.

Amaryllis hybrids. The most marked improvement was in the combination of the hardier scrub plant found in so many yards with a vigorous group of plants from a pink-flowered parentage. The seedlings which flowered displayed the vigor of both parents, plus the heads-up attitude of the pink-flowered parent, plus colorations superior to what might normally be expected. Back-crosses and self-crosses have been made, as well as more attempts at bi-generic crosses. Seedlings are larger and more numerous than those of the past generation. Surprisingly, one of those which flowered displayed a tendency to flower repeatedly. Another surprise was their readiness to set seed.

Habranthus andersonii var. *roseus.* From seeds sown in September 1968, 36 bulbs flowered 22 months later. The cold-frame put on an interesting display as 26 flowers popped up simultaneously, followed by 20 more the following day. However charming they are, with their pink faces held upward to the light, they fade quickly. The timing was such that all were deanthered before they were fully open, so that crosses were sure, with no chance for self-pollination. All except the most prolific bloomers and the firmest seed-setters have been rogued out. Crosses are being tried to create a ''break'', so that bi-generic crosses will be accepted more readily.

Habranthus cardenasiana. These lovely pink flowers are a welcome addition to the late summer show. However, they have not yet accepted any crosses.

Narcissus. Again there were some new seedlings to watch as they flowered for the first time. Again only a few were considered worth saving. But the fun is still there. They are easy to grow, and once they start flowering there is a new crop every year. More species bulbs have been added to the small plantings, including some tiny beauties which have been crossed with the larger commercial hybrids.

Chemical treatments. Results of soaking seeds and bulbs in a colchicine-water solution continue to show up as distorted plants and flowers, with occasional emergences of exceptionally vigorous plants. This summer one of a group of seedlings from a white-flowered *Agapanthus* sent up a tall, straight, strong scape with a large umbel—but the flowers were pale blue! In middle springtime one of the treated hybrid *Amaryllis* sent up a scape with Siamese twin flowers; the flower was two complete flowers and flower parts fused at the ovary and tepaltube. It would not set seed. In middle July a strong *Brunsvigia rosea* scape made its initial showing. Its first flower had nine (9) anthers and nine (9) petals, all neatly and evenly spaced, with three sets of three alternating. Excitement couldn't be suppressed, even when the subsequent flowers all had the normal six flower parts. The pollen from Number 1 flower was used to self flowers 1, 2 and 3. One of the white-flowered hybrid *Amaryllis* which had been treated with colchicine solution produced a generation of exceptionally strong seedlings, one of which flowered last May with a dazzling display of three scapes in succession, the first of which had four pure white flowers which opened simultaneously on a tall, strong, straight scape. Pollen from this first flowering, when applied to other plants which had experienced colchicine treatment, produced large pods of fat seeds, most of which are now sending up leaves noticeably longer and stronger than average. The conclusion that such treatment can result in stronger plants is easy to reach, after only three generations of seedlings.

Growing methods. It was interesting to note in the 1970 *Plant Life* (pp. 130 ff.) that the "paper sandwich" method of handling *Amaryllis* seeds is successfully used by others. Since my undergraduate days as a botany lab assistant I have been using layers of absorbent paper for all sorts of seeds. Currently paper towelling is my favorite. Germination is high and uniform, and I am able to water the plastic dishpans so thoroughly that they can be neglected for longer periods of time than flats which do not have the layers of paper. As I write this now I am preparing to leave on a two-week vacation trip, completely confident that the pans of seedlings will be in excellent condition when I return. Next season I intend experimenting with several layers of paper towelling in the pans, approximately ¾ inch apart, to learn how long one can neglect such pans between waterings.

Miscellaneous comments. I should like to address a few words to those who might be wondering if they should attempt hybridizing and other experimental avenues of interest. By all means, do so! It will add an immeasurable set of values to your life. I have been experimenting with plants since I was a lad of six. Although I have never developed anything that could be rated as outstanding, there has been a constant succession of new things to observe, as seedlings came into flower. I fully expect that twenty years from now, when I am 80, I will still be eagerly watching the thrust of flower scapes as they greet the world for the first time. The Amaryllids offer an exceptionally varied and interesting assortment of plants with which to experiment. Growing top quality plants with special care, to try to attain the maximum the plant has to offer, is also rewarding. In addition to the expansion it adds to your appreciation of the basic rules under which we all live, plant breeding affords a healthful exercise of several disciplines which contribute to a vague quality called "peace of mind".

THE CHARMING **EURYCLES AMBOINENSIS**

Mrs. F. J. Pahls, *3035 S. W. 15th Street,*
Miami, Florida 33145

Eurycles amboinensis, according to Nicholson's "Dictionary of Gardening" is a tropical bulb which requires "Stove Treatment". If I had read this about three years ago, when I first received the plant from Mr. Alek Korsakoff of Jacksonville, I might have had more success with it. True, the plant bloomed that first season, but two subsequent years without flowers changed my belief that this was an ''easy'' plant.

The plant, in a six-inch pot, sits on the moist gravel in our screenhouse. In the winter, our screenhouse is protected on the north and west sides by plastic sheets. This is sufficient protection for our orchids and other tropical plants unless temperatures below 45° are predicted by our Weather Bureau. (I hasten to add that this occurs only infrequently.) Actually, the temperature in our garden probably is several degrees higher than the official figure, because our garden is well protected by a wall of shrubs and many trees which serve to contain the heat stored in the ground.

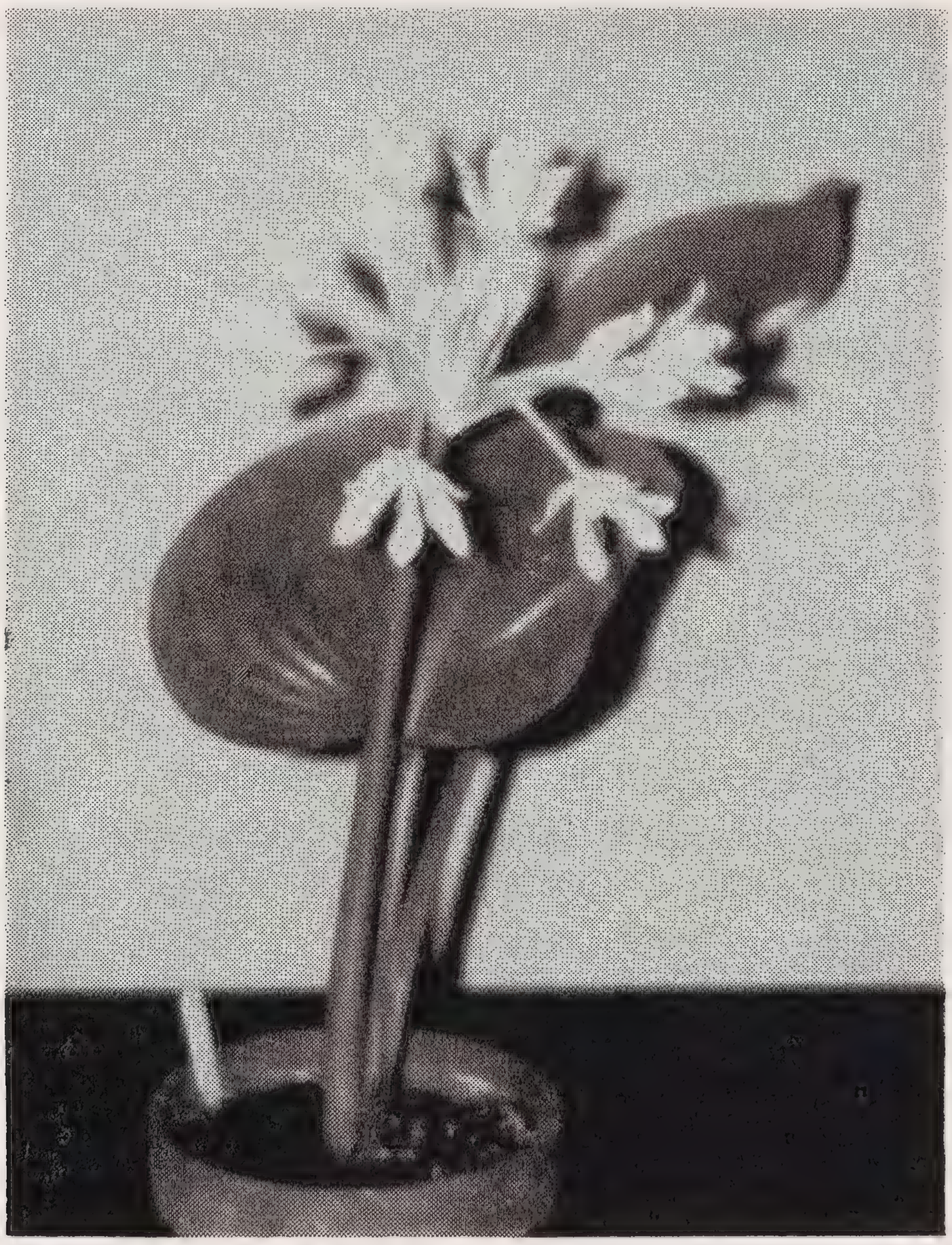

Fig. 30. **Eurycles amboinensis** as flowered by Mrs. F. J. Pahls, Miami, Florida.

In addition to all this, we decided to further protect the *Eurycles* by placing over the plant, during ''cold spells'', a heavy shopping bag, the type so convenient for Christmas shopping.

During the past spring and summer, the plant grew well, especially during humid weather. It was fertilized every two weeks, usually with Hyponex, although occasionally we used orchid fertilizer diluted to half strength. Last November, when we had some cooler weather, all growth stopped, although the plant retained its foliage.

The future looked promising until we had two record breaking cold spells in January, 1970. These in each case lasted three days; the official low at night was 39°, with very little warmup during the daytime, and heavy rains left the ground cold and wet. Many tropical plants in our garden were severely damaged. In the screenhouse, which had been completely covered with plastic and blankets, damage to plants was light. When we removed the shopping bag from the *Eurycles* we found that the foliage was undamaged by the cold. Nevertheless we felt that the prolonged cold probably had ruined any chance of bloom.

By this time, too, the foliage looked old and dilapidated and finally I decided I might as well cut it off, (all but one good leaf). In the spring one new leaf appeared but for weeks thereafter there was no further sign of activity, possibly because of the dry weather.

It was in late May that *Eurycles amboinensis* surprised us by showing its first inflorescence (Fig. 30). Like the *Clivia*, the *Eurycles* flowers begin to open before the flower stalk reaches its full height. Every day one or two flowers opened, and since the flowers are long lasting, by the time the stalk had reached its full height, it was a gorgeous sight with about ten pure white flowers. In all, there were nineteen flowers, each with sepals and petals about 1½″ long, the flowers being about 2¼″ across. Quite spectacular!

Crossing with *E. cunninghami* was unsuccessful but a few pods are developing on the flowers that were selfed.

And while I write this, my plant has a second inflorescence, this with 11 flowers open, and at the base four new leaves have developed, practically all at the same time. Both this second inflorescence and the foliage made very rapid growth, probably because of the very warm wet weather we have been experiencing.

Definitely *E. amboinensis* requires high relative humidity and year 'round warm weather, but how low a temperature the plant will tolerate and still produce bloom is a question. Perhaps someone who grows this plant in a greenhouse with controlled heat can supply this information.

In conclusion, I agree with Mr. Korsakoff that this is one of the most spectacular amaryllids that I have seen and definitely worth growing.

SOME OBSERVATIONS IN 1970

Russell H. Manning, *717 Valley Avenue, Route #1 Box 8,*
Spring Valley, Minnesota 55975

Recently the writer quartered an *Amaryllis aulica* bulb and sent the various pieces to several persons who were interested in the dwarf *Amaryllis*. This particular type of *A. aulica* was grown from seed obtained from Rex D. Pearce, Seedman, in 1963. Out of the 17 seeds which were advertised as ''Lily of the Palace'', 3 matured with two types of bloom, 2 as *A. aulica forma stenopetala* and the other the regular form, *A. aulica* Ker-Gawl. The longest leaves scarcely were seldom over a foot and usually much less. The bulbs never made any offsets in all these years of growth, the roots were thick and heavy and probably were as large in bulk as the bulb itself was, the flowers had remarkably little green in them considering that many others made mention of this in theirs. Never did any of these set any capsules nor did any of its pollen set any seeds insofar as is known. The leaves were pretty enough to have been grown for their neatness and attractiveness.

In the first week in September of this year, a *Cyrtanthus hybrida,* Thompson & Morgan's #1283n 1966 catalog, bloomed which was remarkable not so much that it does not resemble the plate on page viii (of the above cited catalog) of the seedsman but it does resemble one which Dr. Dyer doubted was in existence. This plant is not the pure species *Cyrtanthus vittatus,* as it has the large 3-pronged stigma and a single bloom per scape from its other parent which may be *Cyrtanthus sanguineus.* These plants have been remarkably weak growers. But the reward of the single bloom has been well worthwhile as it is an old rose color of some two inches wide, and is poised at a jaunty angle which enables the viewer to see the throat's coloration. Its form, from *C. vittatus,* is much more refined and stylish than the more commonly tubular forms.

The writer's recrosses of that original hybrid *C.* x *brownii* bloomed this year and those, who are fond of the colors in which orange sherberts come in, will find these plants well worth reduplicating. The several references which have been noted in HERBERTIA and in PLANT LIFE fail to give much about them except that they are not too strong of growers. The parents for these were from the selfed offspring of *Cyrtanthus purpureus* (syn. *Vallota*), which eliminates a lot of the weaklings if one uses the 1st bloomers as the podparents and I would suggest trying to get your pollen from Alek Korsakoff as not all *C. sanguineus* pollens will set on *purpureus.* While some of the bloomstalks are rather weak, fortunately those with the better forms, poise and size had inherited a good stalk from the podparent. These had blooms up to 3″ and 3¼″ across the face and were poised to be seen and made a good spot of color. These plants are extremely healthy and robust although they are somewhat slow to come into full maturity. Where these can be satisfied to be grown well outdoors, they should make a most stunning border for the fall season as the color inherited from the podparent carries for a long distance without being harsh.

For the last several years in preparing the *Amaryllidaceae* bulbs which have been grown out in the soil for the Winter's storage season, the whole plant is dug ahead of the killing frost, the roots carefully being left-on with all the tops and then are all washed down with a hose. They are then allowed to dry off (the roots are kept covered from the wind and sun) before putting them into storage cardboard boxes into which a layer of 1″ or 2″ of dry, finely ground peat has first been spread. The various whole plants are laid carefully in, and a layer of the same peat is sprinkled over each group until it is thoroughly covered and with enough so that the foliage does not mat-down tightly.

One must not be sparing in the use of the peat as it locks in the natural moisture level of the bulbs. During the Winter's time, the foliage gradually yellows-off through ripening and by Spring, there are nice plump bulbs already to start growth from their storage in the basement.

STORAGE OF CLIVIA SEED

W. Quinn Buck, *Arcadia, California*

A batch of *Clivia* seed from a famous European grower was in rather poor condition when it reached me about the middle of May, 1970. Hoping at least to plump up the shriveled seed and get moisture back into them, the seed were put in a small jar of water and set in a refrigerator maintained at a moderately cold temperature. Very quickly the seed were restored to normal plumpness. Rush of daylily pollinating and other summer work caused delay in the planting of the seed until Sept. 19, 1970, at which time practically all appeared to be in excellent condition as compared with their state on arrival. Several of the very small seed evidently had dried out beyond recovery before they were stored.

This experience, together with past experiences at the Arboretum with ''old'', shrivelled seed, suggests a number of experiments that could be undertaken by those interested in growing these fine plants from seed: Growers who sell seed might find it advantageous to store their freshly gathered seed in this way to prevent dehydration before shipment to customers. The effects of this cold storage on germination and growth would be most interesting. Storage in weak nutrient solutions, in colchicine solution, or in certain other solutions, could give interesting results and should be tried.

SOUTH AFRICAN LETTER

Leon Boshoff-Mostert,
Kleinskuur, Balfour, Transvaal, South Africa

During the course of my relatively short span of life which has just recently passed the three score mark, I am convinced that I have witnessed the greatest advancement in human progress in every sphere of endeavor. The present generation lives in an era where undreamt-of scientific achievements follow one upon another at an unprecedented tempo, overshadowing everything that has seen the light of day, from the time of separation of sea from land in the first chapter of Genesis, up to the end of the nineteenth century. Many, if not all, of these achievements have been possible because of the discoveries, inventions and research of scientists during earlier centuries upon the foundations of whose work successive generations have built newer structures.

Man has produced things chemical and otherwise which had not previously existed but, nevertheless, the constituents of all these new products are derived from resources provided by nature from time immemorial. Advancement in the plant world may be viewed in the same light as that in the industrial field. Our resources were the species provided by nature and the improvement thereof was a challenge to those with creative minds and the urging desire to leave to posterity a legacy greater than their own heritage. Their incentive was not motivated by monetary considerations and to those horticultural pioneers of earlier generations we cannot ever pay sufficient homage.

If there is an unbiased specialist in any one single phase of plant breeding, let him now speak or forever hold his peace! I, for one, admit to a biased mind and on that admission and on those premises I express the conviction that of all the flowers, the *Amaryllis* leads the field in the advancement and improvement of hybrids. One is inclined to think that a saturation point should be reached. Each year, evaluating the cream of the new creations among my seedlings. I get the impression that, with the latest improvements, the present collection of monochromes, bi-colours, bi-tones, blends or polychromes cannot be improved upon. But yet the breeding programme is continued and again, somehow, something new is presented which, in some or other characteristic exceeds the best in similar varieties previously egotistically regarded as the apex of achievement in that particular direction. It must be admitted, however, that the scope progressively becomes contracted and the crop of discards proportionally expands.

It would be a revelation to visit horticultural archives in which there are kept sketches or lifelike drawings or paintings of all the forerunners of the latest creations upon which the *Amaryllis* hybridists of the present century have had and still have the pleasure of feasting their eyes. There was a horticultural book published in London towards the end of the eighteenth century which contained hand-painted colour prints of a variety of flowers, including *Amaryllis,* all of which at that time, I am inclined to presume, were grown in Kew Gardens. I do not know who the writer or compiler of the book was, because it was mutilated by its owner, a lady in Natal who specialized in floral art. Opposite each coloured print in the book was a page devoted to the description of and historic and other data on the bloom. The lady in question removed from the book any colour print in which a client was interested. This was then framed under glass and together with the relative page, also cut from the book, was sold at the moderate cost of approximately $7.50.

Some eighteen years ago, during a flower show in Natal at which my wife acted as judge, she came across this lady and, being keenly interested in such antiques, bought three of the plates, being of ''Amaryllis Equestris—Barbadoes Amaryllis, or Lily.'', numbered (305), ''Iris Xiphioides. Pyrenean Flag.'', numbered (687) and ''Iris Virginica. Virginian Flag.'', numbered (703). All pages are headed and subheaded in a similar fashion in successive lines thus: (305 or other appropriate numerals), name of flower in bold print, after which—or rather under which follows the following: ''Class and Order'', ''Generic Character'', ''Specific Character and Synonyms''. The characters are described in Latin and this is then followed up by references, in English, to the history, habits of flowering and other related data. Every "s" in the script, except one that comes at the end of a word, is printed like the letter "f", but without the stroke through the middle of the "f". The picture was obviously coloured in by hand before being bound in the book and one wonders how many artists were employed for the publication of say, one thousand copies of the book. Beneath the colour print of the *Amaryllis,* the following is printed in italics: "Pub. by W. Curtis, St. Geo. Crescent, July 1, (1795.)" Under the headings on the opposite page, one reads the following:—

"Mr. Aiton, in his 'Hortus Kewensis', has inserted this species of *Amaryllis,* as named and described by the younger Linnaeus; he informs us, that it is a native of the West-Indies, and was introduced by Dr. William Pitcairn, in 1778: as its time of flowering is not mentioned, we may presume, that it had not blossomed in the royal garden when the publication before mentioned first made its appearance; it no doubt has since, as we have seen it in that state in the collections of several Nurserymen, particularly those of Mr. Grimwood and Mr. Colvill.

"It flowers towards the end of April.

"The flowering stem rises above the foliage, to the height of about a foot or more, produces from one to three flowers, similar to, but not quite so large as those of the Mexican *Amaryllis,* to which it is nearly related; it differs however from that plant essentially in this, that the lower part of the flower projects further than the upper, which gives to its mouth that obliquity with (presumed to be which) Linnaeus describes.

"The spatha is composed of two leaves, which, standing up at a certain period of the plant's flowering like ears, give to the whole flower the fancied resemblance of a horse's head; whether Linnaeus derived his name of equestris from this circumstance or not, he does not condescend to inform us.

"Mr. Aiton regards it as a greenhouse plant; like those of many of the Ixias, however, the bulbs are of the more tender kind.

"It is propagated by offsets, but not very readily."

What a pity that such a historic horticultural monument, as the copy of this book certainly was, should have been mutilated. I wonder whether money would ever induce my wife to such action with her rare copy of "The Genus Iris" produced by W. R. Dykes in 1912. Be that as it may, we are glad to have those three pictures with the three pages from that eighteenth century book. It would be interesting if any of the readers, or perhaps our Editor, could tell us the name of the author of the book.

We also have a hand-painted picture of "Amaryllis Johnsoniensis", the caption being similarly printed in italics. There is no indication of the date published or the name of the publisher or artist. It is a present from a friend who bought it some years ago at an antique shop in Israel where it was attributed to a first decade creation of the nineteenth century. With an eye on our present-day hybrids, it is stimulating to ponder over the fact that in those days—and justifiably so, these two blooms were looked upon as incomparable as regards exquisite beauty of form and colour.

I would urge all Amaryllis fanciers to try their hand at breeding by the simple act of applying the pollen of the "father" bloom to the stigma of the "mother" bloom. To exclude the possibilities of self-pollination, the anthers of the "mother" bloom should be removed before they start shedding their pollen grains. I have found that the time of pollination to ensure optimum fertile seed production is as soon as the stigma gives signs of becoming moist. I am not sufficiently informed to give scientific reasons for my contention and I may be wrong. The observations of our Editor in this regard will certainly be a reliable guidance. Breeding may be done on a scale dictated by the size of available beds to accommodate the crop of seedlings. The sight of the first blooms of one's own breeding is most gratifying and thrilling. But do not develop such a sense of possessiveness as to deter you from discarding, if need be, the entire batch of bloomers. It is fallacious to keep any new variety if its blooms are not an improvement on those of its parents. At the same time, keep in mind that with top quality material, your chances of producing something outstanding are as good as those of the professional breeder or even the trained geneticist. Although by far in the minority, some of the finest blooms have been bred by amateur gardeners and fanciers. The successes of these tyros are by far in the minority for the reason that commercial growers are equipped to raise tens and hundreds of thousands of seedlings over each successive season.

In the 1963 issue of the Year Book I wrote extensively on Amaryllid Culture with a view to covering the various facets of the practical application of methods adopted in my own particular undertaking. Fundamentally, the modus operandi has remained unchanged. There are, however, a few innovations that have since been introduced which may be regarded as improvements and worthy of comment.

Firstly, I refer to the seed bed shown on page 82, Fig. 17 of the 1963 Year Book and then to the portable steel framed hessian covers shown in the same issue on page 85, Fig. 18. These frames effectively served the purpose of protecting the young seedlings against hail and frost but there was an obvious drawback in their construction. During downpours of rain, the hessian persistently inclined to cause continuous dripping on particular spots in the bed, leaving numerous seedlings awash with roots in the air. Holes then had to be filled in and the disturbed seedlings replanted. Changing the order of the covers only changed the location of the erosion spots. This problem was solved by substituting the portable hessian covers with wooden sliding frames with corrugated fibre glass covering. To the underside of these frames are attached two metal sliding rails which are flanged so as to prevent the frames from slipping off the sides of the bed enclosure. Sections of steel fencing posts (12 lb. posts) were used as sliding rails as shown in Figure 31. Here can also be seen one of the sides of the seed bed which

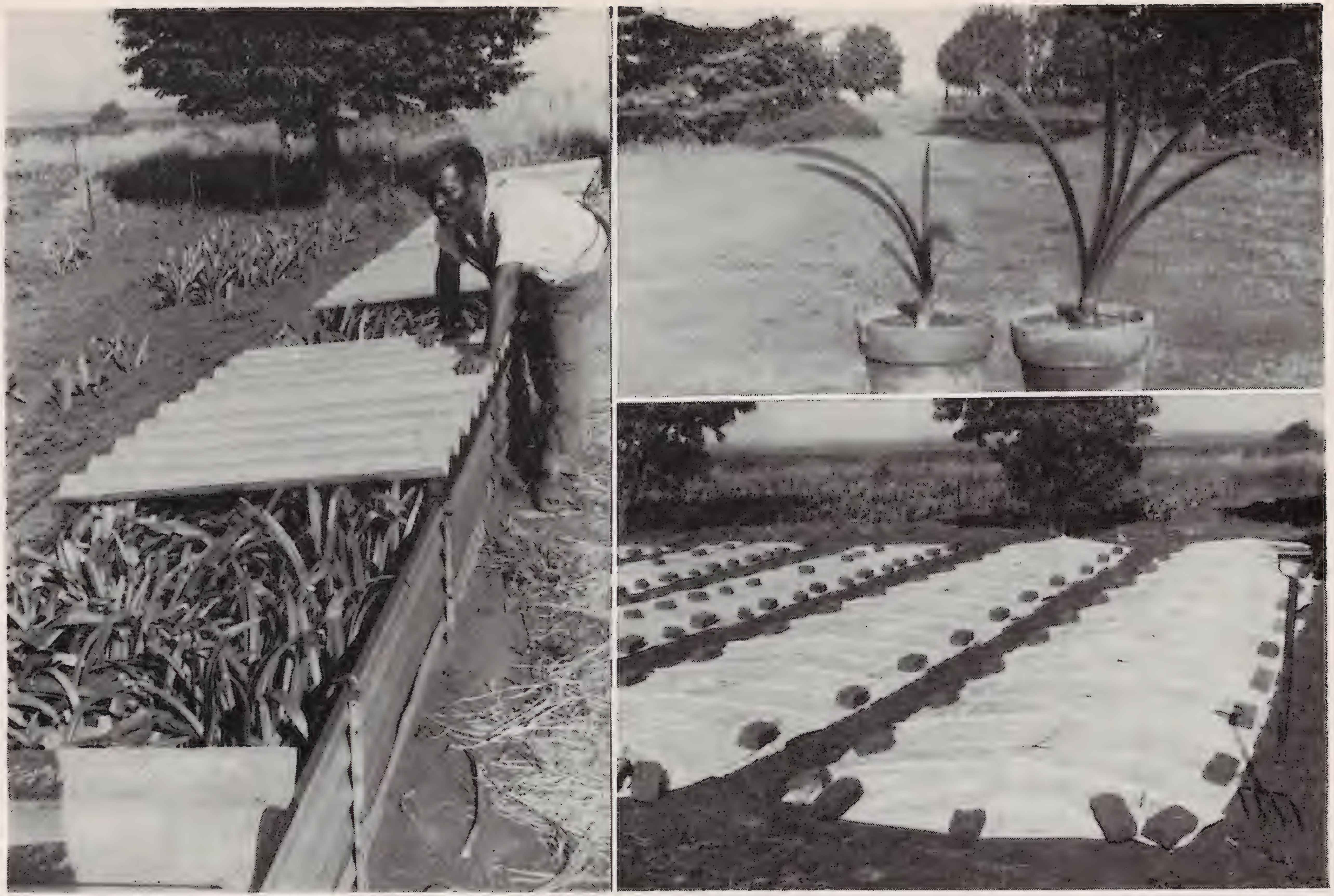

Fig. 31. Amaryllis culture: **Left,** Seed bed with portable hessian covers. **Upper right,** effect of foliar feeding; control plant on left received fortnightly foliar feeding for six months; contrasted with plant on right which received fortnightly foliar feeding throughout the year; and **Lower right,** showing covering during soil fumigation.

is of corrugated steel sheets cut lengthwise in half and bolted to angle iron standards firmly planted in the ground. The only modification to the old structure was the attachment of a 1½″ x ⅛″ flat steel section to the upper edge of the sides on which the new frames freely slide. The fibre glass sheets are of a 60% translucency.

During the past growing season I have continued with the fortnightly liquid fertilizing programme. In addition to this, I also applied liquid foliar feeding with a fine nozzled high pressure spray pump at fortnightly intervals in the intermittent weeks. In order to determine the value of foliar feeding I kept two control specimens of the same size and variety from a batch of bulblets vegetatively propagated in my incubators. These bulbs were planted in the same medium and at the same time in 7″ pots. They received similar treatment in every respect except that one only received foliar sprays over a period of six months. The plant on the right in Fig. 31 advanced in development in a marked degree compared with its untreated counterpart on the left. This control operation has proved not only the value of foliar fertilizer but also that the trifling additional cost is justified.

Lastly, I wish to touch on the matter of soil fumigation which must be accepted as a pre-requisite in nursery activities. Before planting, the beds are treated with an approved liquid soil fumigant, injected with a suitable injector pump to a depth of 10 to 12 inches and at a volume and spacing rate as prescribed by the manufacturers of the fumigant. The suppliers also instruct that, after injection, the beds be raked smooth and then sprinkled with water to provide a ''sealed'' topsoil covering. The efficacy of such covering, to my mind, is questionable. After the prescribed spray over the treated beds, I cover the beds entirely with the plastic bags in which we receive our granular agricultural fertilizer. Squares of four plastic bags stapled together form ideal ''blanket'' units which are easily handled and these are spread over the beds, allowing sufficient overlap of ''blankets'' to ensure minimum escape of fumigant gases. As shown in Fig. 31, the covering is firmly held in position by bricks and when the covers are removed after two weeks, there is a horde of dead centipedes and other pestilential insects which have found shelter under the covering and there shared the fate of nematodes and other undesirable elements in the soil.

Crinum thaianum Joachim Schulze, **sp. nov.** (Amaryl.). **Holotypus:** No. 1007 (TRA), J. Schulze, Apr. 18, 1970; **isotypus:** No. 1010(TRA), J. Schulze, Apr. 18, 1970, deposited in the U. S. Nat'l Herbarium (US).

Planta vere aquatica, bulbo usque ad 15 cm. longo, collo 3—6 cm. longo; follis usque ad 20 vel pluribus 2—3 m. longis 1.5—2.5— cm. latis, scapo usque ad 80 cm. longo 5—8 cm. diametro; umbella 5—8 vel raro usque ad 10-flora; ovario oblongo; tubo tepalorum 12—14 cm. longo; segmentis tepalorum 8—10 cm. longis 8 mm. latis; staminibus 6—8 cm. longis; antheris 12—14 mm. longis; stylo quam staminibus brevioribus. Species indigena Thailandicaest.

The complete article will appear in Vol. 28, PLANT LIFE, 1972.

EDITOR'S MAIL BAG—continued from page 12.

just getting settled. Luckily I was able to ship all my *Amaryllis* bulbs but a number were lost shortly after arriving here. Fortunately, the bulbs planted in the open ground did better than those planted in pots. Presently I am trying to replace some of the bulbs lost. I hope by next year or the following year I will have some material for the Amaryllis Year Book.''

It is suggested that the members in California get in touch with Mr. Sudd in the meantime.

Under date of September 18, 1970, Mr. Ralph A. Paulsen, 12726 Kling St., Studio City, Calif. 91604, writes, ''Before I entered the military service, Mrs. Anthes and I had quite an extensive collection of *Amaryllis* species and other amaryllids. . . . However, we had only a few specimens of each kind. With my going into service, and Mrs. Anthes' subsequent illness, we lost everything we had, except a form of *Brunsvigia minor* that had gone wild in Peru. . . . I am anxious to get started again. . . .''

It is hoped that members will get in touch with Mr. Paulsen, and help him to build up a new collection. Please write to him directly.

Under date of October 7, 1970, Dr. K. R. Spearman, 2641 Via Pacheco, Palos Verdes Estates, Calif. 90274, writes that ''My only worthwhile project is an attempt to develop a large-flowering strain of fall-, and winter-blooming hybrid *Amaryllis*. This project is only now getting started as I try to gather fall-blooming species, and a single American *Amaryllis* hybrid which blooms each fall for Polly Anderson. Results will be reported later.''

Will those who have fall-blooming species and hybrids please share their surplus stock with Dr. Spearman so that he can get his project moving more rapidly?

Mr. Charles L. Harris, Route 4, Box 78-G, Griffin, Georgia 30223, writes under date of October 27, 1970, that he has blooming size *Worsleya rayneri,* the Blue Amaryllis, and *Amaryllis calyptrata* bulbs for sale in lots of not less than 50 bulbs at wholesale.

Your Associate Editor, Dr. Harold N. Moldenke, 303 Parkside Road, Plainfield, N. J. 07060, has been seriously ill. Under date of Feb. 21, 1971, he writes, ''I have been in the hospital now 130 days in all, on 6 visits. I've had 5 operations. Over Xmas I was for 10 days on the critical list with peritonitis and the nurses had me marked ''possible death'', but I fooled them and didn't die. I'm home now to recoup strength for my 6th operation in June.''

We will all be praying for Dr. Moldenke's full recovery.

It is with great sadness that we have to report the death of Dr. Fred J. Buchmann of Baton Rouge, La., on Jan. 22, 1971. An ''In Memoriam'' article by his colleague, Dr. Joseph K. Mertzweiller, will appear in the 1972 issue.

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SPARAXIS BREEDING, 1971

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Baldwin Park, California 91706

Early in 1960, my first *Sparaxis* bulbs bloomed. There were only twelve of them, but the impression they made on me went deep. So deep, in fact, that before I quite realized what was happening, I became enthused and decided to hybridize these floral diamonds-in-the-rough. The ten years since then have been spent in developing what impressed me most about them: their potential for improvement.

There have been times, it's true, when this enthusiasm-plus-potential combination has been all but swamped out by the forces of frost, large-scale gopher destruction, a limited time schedule, endless weeding chores, and the monumental tasks of planting and digging bulbs each year. But somehow, while not necessarily scoring an overwhelming victory, the enthusiasm/potential ticket has at least made progress. So much so, in fact, that last year found me planting in excess of 20,000 bulbs and at least twice that many seeds.

While it has been an uphill climb with few rest stops, there have been some wonderfully rewarding satisfactions along the way. The first of these came from learning what a responsive plant I was working with. Although called ''Sparaxis'', they are, technically, a hybrid form between one or more species of *Sparaxis* and one or more species of *Streptanthera*, a near relative. Species which have been used to produce our modern *Sparaxis* hybrids include *S. tricolor, S. bulbifera,* and *S. grandiflora,* along with *Streptanthera cuprea.* It is possible that *Streptanthera elegans* may have been used as well. The kaleidoscopic effect produced by the color patterns in the throats of many of the hybrids is no doubt due to the *Streptanthera* influence. So, the foundation work of mixing the species already had been done by earlier hybridizers.

My job, then, was to keep the mixing process going. Keep the genetic pool stirred up and when something good appears, develop it.

I have not been disappointed. Within the first few years, an incredible variety of colors and marking patterns was presented. From the original orange-salmon and wine-black of that first dozen—and with some help from a few new bulbs acquired from time to time—the color spectrum reached out every year to include shades I didn't even imagine were possible at first. (More about color later.)

Even so, no breeder works his stock for color alone. To do so leads to serious difficulties with other considerations: health, size, texture, general appearance, and other factors must be considered when an individual plant is chosen for propagation and/or hybridizing.

Having previously hybridized *Gladiolus*, another member of the same plant family—*Iridaceae,* I was not entirely unprepared for working with so similar a genus as *Sparaxis.* Many of the problems which developed were parallels to problems encountered in hybridizing glads.

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The basic approach, however, had to be different. Whereas with gladiolus, individual florets could be protected and carefully crossed with a specific pollen, this has proven impractical with *Sparaxis*, except on a limited basis.

Several factors dictate a different approach. Principal among them are the size of the flower parts (they're simply too small for handling with fingers) and their location. The anthers and stigma are so arranged that preventing accidental pollination is tediously difficult. So, insects do the major part of the pollinating for me. Therefore, only the seed parent is known for sure in any given cross. When seed parents with a history of producing good offspring are used, the drawback of not knowing the pollen parent isn't so great as it might seem. (Certainly it would be interesting and even useful to know both parents for the purpose of scientific cataloguing. But it is not essential when the primary goal is achieving results.)

Just such a seed parent was one of my first good seedlings. I call it 'Aruk'. A beauty in its own right—its habits are excellent, and its color, dazzling—'Aruk' throws seedlings in every color known to *Sparaxis*. This is not an unusual trait in this group of plants; many do the same thing. But 'Aruk' adds that extra plus of good quality in a great many of its seedlings.

The original bulb bloomed the second year I grew *Sparaxis* from seed. It was a lucky break for me. Now, many of its offspring are also seed parents. Although most of the stock of this clone was lost in the big freeze of December 21, 1968 (that unfortunate event destroyed two-thirds of my best clones and seriously decimated the remainder), it is making propagation headway again. Hopefully, I'll have enough for sharing someday.

Earlier, I mentioned color. While hybridizers may not breed specifically for color, let's face it, people do buy specifically for color. So expanding the color spectrum becomes an important goal for anyone working with an ornamental plant. Here is a list of *Sparaxis* colors I've been able to isolate over the years. In most of these color classifications, I have at least one clone that shows marked improvement over older varieties and promises even further improvement to come.

REDS—Lots of these, but good sparkling scarlets and intense true reds are still scarce. 'Aruk' is a red.

ORANGE—Salmon-orange is *the* predominant color in any group of *Sparaxis* seedlings. But where are the good, clear oranges? Still few and far between.

SALMON—Take your pick. More good salmons than anything else. So you choose only the very best.

WHITE—Fairly strong here too. Texture needs to be improved. This is true in colored varieties as well, but it's more noticeable in the whites.

PINK—Old rose, dusty rose, describes the color with greater accuracy. Bright baby pinks are just beginning to show up.

ROSE—Same here as in the pinks. Hope one I selected last year repeats its previous performance.

YELLOW—Muddied with purple. Progress here is slow.

CREAM—Same story as "Yellow".

WINE or MAROON—Lots and lots. But good ones—scarce.

PURPLE—Like pink, dusty. A few show some clarity of color now. Purples often have short, twisted stems.

BLACK—Here's a surprise. *Sparaxis* have some of the blackest flowers I've ever seen. Wine-blacks, purple-blacks, and red-blacks. In some cases, the buds have virtually no hue—just black. Progress here has been quite rewarding.

BLUE—I'll be succinct: there aren't any. There is blue in the throats of certain reds and oranges, however. And some purples have a blue base to the color. So hope remains for the future.

In addition to these basic colors, some interesting variations are appearing—a white and orange picotee; a bizarrely patterned three-tone rose; a true lavender; a near-brown; and numerous yellow-purple combinations that people either like very much or hate with equal intensity.

And different forms are appearing. A few now have ruffled petal edges. Some others are star-shaped. While flower size is definitely on the increase in general, several minis have earned their place on the propagation list. All the bulbs I ever purchased from nurseries have been discarded. They were simply inferior to clones I now have.

So where do we go from here? Forward, of course. I'm currently working to induce polyploidy in some individuals, giving them extra chromosomes within their cells. If the experiment is successful, this will give the genetic pool even greater variability. Which means more resources for hybridizers to draw upon and, ultimately, an even wider range of desirable characteristics upon which to base selection of individuals.

Chances are, I'll be busy for at least another ten years.

BLEAKLEY—AMARYLLIS IN AUSTRALIA—continued from page 106.

to Dr. H. P. Traub who very cordially invited me to become a member of the American Amaryllis Society. I would be very interested in any information on the species and also hybrids, how you grow them, what are their wants and needs and *could I obtain seed of the species* as in Australia we have very strict quarantine regulations on the importation of plant material. I would greatly appreciate any letters and in return I could exchange seed or maybe there would be some other varieties of Australian plants I could send. My hybrids usually flower from October onwards.

I do not know of many other growers in Australia. There is the Blue Dandenong Bulb Farm and a few growers in the State of Queensland. I cannot understand why the *Amaryllis* is not so well known here, although lately a few articles have been appearing in our garden magazines.

LATIN AMERICAN AMARYLLIDS, 1970

PEDRO FELIX RAVENNA,
Melián 2240, Buenos Aires, Argentina

[In this department, descriptions of genera and species, and various notes, are translated from foreign languages. The following text represents the writer's collaboration with Correa's Flora Patagónica (Part II, 1969). He here makes the necessary changes of names and additions to the synonymy, as well as notes required because of subsequent studies. Translations on descriptions of some *Tristagma* species are not included because these have already been published in the 1969 edition of Plant Life.—*Pedro Félix Ravenna.*]

NOTHOSCORDUM KUNTH **NOM. CONS**

Kunth, *Enum, Pl.* 4: 457. 1843

Nothoscordum bonariense (Pers.) Beauverd, *Bull. Herb. Boiss.* Ser. II, 8: 1001. 1909.—*Ornithogalum bonariense* Persoon, Syn. Pl. 1: 363. 1805.—*Nothoscordum pulchellum* Kunth, Enum. Pl. 4: 458. 1843.—*N. gaudichaudianum* Kunth, *loc. cit.*—*Allium bonariense* (Pers.) Grisebach, *Goett. Abhandl.* 24: 319. 1879.

1a. Filaments contiguous. Ovary almost cylindrical, somewhat narrowed toward the base. ....1. *inodorum* ssp. *nocturnum*
1b. Filaments not contiguous. Ovary almost ovoid. ....2. *bonariense*

Nothoscordum inodorum (Ait.) Nicholson ssp. *nocturnum* Ravenna, Corr. Fl. Patag. 2: 145. 1969.

Plant about 19-48 cm tall. *Bulb* ovoid about 12-20 mm long, 12-17 mm wide; outer coats blackish; pseudo-neck to 2-6 cm long. *Leaves* 3-4 ca. 14-30 cm long, 3-7 mm broad, glaucous, slightly channelled to almost flat, obtuse. *Scape* to 15-55 cm long. *Spathe* 4-15-flowered; valves ventricose, membranous ca. 18 mm long, connated at the base for 5 mm. *Pedicels* to 5-15 mm, upright at anthesis, longer and radiate at fructification. *Flowers* about 7-8 mm long (in expanded flowers), 10-12 mm in diam. *Tepals* oblanceolate, spreading at night, concrescent for 4-4.5 mm, then 9 mm long, ca. 3-3.4 mm broad. *Filaments* flattened, oblong-subulate, almost equal, always contiguous, sometime partially or irregularly connated toward the base, about 6-6.3 mm long, 1.25-1.4 mm broad; *anthers* oblong about 1.6 mm long. *Ovary* ca. 4.4 mm long, 1.8 mm wide; *style* 4 mm long; *stigma* capitate-trilobed. Capsule obovoid about 7-8 mm long, 3-3.5 mm wide; seeds black, irregular, angled, about 1.3-2 mm long.

A native in the hills of the province of Buenos Aires and also in Río Negro. It differs from the typical subspecies by its nocturnal flowers and the larger almost cylindrical ovary.

Nothoscordum bonariense (Pers.) Beauverd

Plant about 6.5-30 cm tall. *Bulb* ovoid, whitish, to 11-12 mm long, 9-10 mm wide, with a pseudo-neck. *Leaves* linear, to 5-15 cm long, 0.8-1.8 mm broad. *Scape* cylindrical about 4.5-33.5 cm long, 0.9-1.7 mm broad. *Spathe* bivalved; valves somewhat unequal, the lower to 9-11 mm long, the upper ca 6.5 mm, sometimes reddish. *Umbel* 2—4-flowered. *Flower* infundibulate to subrotate, white, tinged purple in the outside of tepals, to 8.5-11 mm long, 9-12 mm in diam.; *pedicels* to 1-1.5 cm long at anthesis, longer and radiating with fructification. *Tepals* concrescent for 1.2-1.8 mm, the outer oblong ca. 7.1-8 mm long, 1.9-2.5 mm broad, inner ones lanceolate, to 1.8-2.8 mm broad. *Filaments* slightly unequal, the episepal to 3.3 mm, epipetal 4 mm; *anthers* small, versatile, oblong. *Ovary* sessile, subglobose, about 1,9-2 mm long; *style* ca. 3.2 mm long; *stigma* capitate.

It grows in damp places. *Nothoscordum pulchellum* Kunth was apparently based on a specimen with buds only; its author says that the flowers are 4-5 mm long. Differences in the size of leaves of this and *N. gaudichaudianum* Kunth, show that they are mere ecological forms. *N. sellowianum* Kunth seems to be identical with this species.

TRISTAGMA POEPP.

Poeppig, Fragm. Syn. Pl. Phan. 8. 1833.

Tristagma ameghinoii (Speg.) Spegazzini, Anal. Mus. Nac. Buenos Aires, Ser. II, 4: 172. 1902.—*Brodiaea ameghinoii* Spegazzini, *Rev. Agronom. La Plata* 7: 575. 1897.

1a. Tepals thickened, almost finger-shaped:
  2a. Tepals narrowed toward the apex, flexuose. Flowers entirely greenish. ....1. *ameghinoi*
  2b. Tepals almost of the same width throughout, somewhat blunt, often recurved but not flexuose. Flowers a brownish purple, sometimes only partially greenish. ....2. *nivale*
1b. Tepals flat, white, often with a brownish-purple or brownish-green streak on the outside:
  3a. Epipetal filaments to 2 mm long, episepal ones shorter. Flowers ca. 8-14 mm in diameter. ....3. *anemophilum*
  3b. Epipetal filaments to 3.9-5.5 mm long, episepal ones shorter. Flowers about 20-35 mm in diameter. ....4. *patagonicum*

Tristagma ameghinoii (Speg.) Spegazzini

Plant about 9-20 cm tall. *Bulb* ovoid ca. 16 mm long, 12 mm in width, sometimes with a weak pseudo-neck. *Leaves* linear, a grayish green, about 12-23 cm long, 1.4 mm broad, slightly channelled. *Scape* ca. 10-16 cm long, 1 mm broad. *Spathe* bivalved, 1-2-flowered; valves subequal, membranous, to 13-15 mm long. *Flowers* pedicelled, an olive green, about 9-12 mm long, 10-18 mm in diam. Tepals thickened, to 5.5-9 mm long, 0.7-1 mm broad. *Perigone-tube* ca. 9.5-12 mm long, 2.3 mm wide. *Filaments* very short and narrow, flattened, the episepal inserted at 7.1 mm from the base of the tube, about 1-1.5 mm long; *anthers* yellow about 2.3-2.4 mm long. *Ovary* ovoid or oblong-ovoid, ca.

2-2.5 mm long, 1.8 mm in width; *style* thick, to 1.2-1.5 mm long; *stigma* widely capitate.

ZEPHYRANTHES HERB.

Herbert, Append. Bot. Reg.: 36. 1821.

Zephyranthes filifolia Herb. ex Kraenzlin, Kew Bull. 1913: 190.

Plant about 15 cm tall, when in flower. *Bulb* almost globose, to 15-23 mm wide, covered with dark brown coats; pseudo-neck to 2.9-8 cm long. *Leaves* present or absent at anthesis, about 10-15 cm long, 1-2.5 mm broad. *Scape* to 12-15 cm long. *Spathe* fenestrate ca. 20-21 mm long, the tubular portion to 12 mm. *Flowers* pedicelled, yellow, about 13-15 mm long, 12-16 mm in diam.; *pedicels* ca. 13.5-19 mm long, the fruiting longer. *Tepals* broadly oblanceolate, connate for 2.5 mm, the outer about 12-14.9 mm long, 4.2-6 mm broad, shortly apiculate; inner ones about 12-13 mm long, 4-5.5 mm broad. *Filaments* episepal to 5 mm long, epipetal about 6.8-6.9; basal scales ca. 0.3-0.4 mm long; *anthers* versatile, curved, to 2.8-2.9 mm long. *Ovary* oblong ca. 5 mm long, 2.5 mm wide; *style* straight to 6.5-7 mm long; *stigma* trifid, divisions ca. 2.4 mm long. *Capsule* globose-tricoccous about 16-18 mm in diam.; *seeds* flattened almost discoid, black, about 4.5 mm broad.

It grows in the north of Patagonia, extending its range through the provinces of Buenos Aires, Mendoza, San Luis, Córdoba and Catamarca. It prefers sandy places.

HABRANTHUS HERB.

Herbert, Curtis' Bot. Mag. 51: tab. 2464. 1824.

1a. Flowers white or a pale pink, ca. 48-60 mm long. Spathe 1-3(-4)-flowered .... 1. *jamesoni*
1b. Flowers a sulphur yellow, tinged with purple-brown, ca. 30-35 mm long. Spathe always 1-flowered .... 2. *tubispathus*

Habranthus jamesoni (Bak.) Ravenna, Corr. Fl. Patag. 2: 155. 1969.—*Hippeastrum jamesoni* Baker, Trimen Journ. Bot. 16: 83. 1878.—*Zephyranthes melanopotamica* Spegazzini, An. Mus. Nac. Buenos Aires 7: 169. 1902.—*Amaryllis jamesoni* (Bak.) T. & U., Herbertia 5: 121. 1938.—*Rhodophiala jamesoni* (Bak.) Traub, Pl. Life 9: 60. 1963.—*Habranthus melanopotanicus* (Bak.) Fabris. Cabr. Fl. Prov. Bs. As. 1: 527. 1969.

Plants about 17-40 cm tall. *Bulb* ovoid-oblong or sometimes subglobose, ca. 4-6 cm long, 3-4 cm in width, covered with brownish black coats; pseudo-neck about 8-18 cm long. *Leaves* short or absent at anthesis, linear, channelled, about 20 cm long, 3.5-4.5 mm broad, a dark green, sometimes slightly pruinose. *Spathe* 1-3(-4)-flowered; valves membranous, whitish or a pale pink, bifid, tubular for 6-10 mm toward the base, its divisions ca. 39-43 mm long. *Flowers* white or pink, often only at the throat, slightly ochraceous toward the base, spreading obliquely or horizontal, infundibulate, to 48-60 mm long, 33-60 mm in diameter.

Pedicels ca. 16-43 mm long. *Tepals* oblanceolate, connated for 3-3.5 mm; the outer to 42-50 mm long, 15 mm broad, apiculate, inner to 44-55 mm long, 13-14 mm broad; basal scales membranous, lacerated, ca. 0.8-0.9 mm long. *Filaments* declinate; lateral episepal to 21.5-22 mm long, the upper to 14.5-16 mm long, lateral epipetal about 23 mm, lower epipetal to 25 mm long; *anthers* lunulate ca. 9 mm long. *Ovary* oblong about 5.5 mm long, 2.7 mm broad. *Style* curved, ascending, ca. 34 mm long. Divisions of the *stigma* recurved ca. 4 mm long.

A native of the provinces of San Juan, Mendoza, San Luis, La Pampa, Río Negro, Chubut, and the southernmost part of Buenos Aires. It prefers sandy soils.

Habranthus tubispathus (L'Her.) Traub, *Pl. Life* 7: 42. 1951.; *Amaryllis tubispatha* L'Heritier, Sert. Angl. 9. 1788.; *Habranthus andersoni* Herbert, Edwards' *Bot. Reg.* 16: tab. 1345. 1830.; *Amaryllis andersoni* (Herb.) Grisebach, *Goett. Abhandl.* 24: 320. 1879.; *Zephyranthes andersoni* (Herb.) Baker, Handb. Amaryll.: 37. 1888.

Plant about 8-14 cm high. *Bulb* ovoid ca. 23-27 mm long, 11-14 mm wide, often produced into a pseudo-neck. *Leaves* absent at anthesis, linear, a pale green, somewhat pruinose, about 7-18 cm long, 2-3 mm broad. *Scape* slender, to 4-11 cm long, 2 mm broad, an ochraceous green, especially downwards. *Spathe* ca. 18-25 mm long, tubular, one-flowered, an ochraceous green or brownish; tubular part ca. 11.5-16 mm, bifid for 7 mm or sometimes fenestrate. *Flower* ca. 23-24 mm long, 15 mm in diameter, bell-shaped to infundibulate, a sulphur-yellow, coppery or purplish in the outside and the throat. *Pedicel* to 22 mm. *Tepals* broadly oblanceolate, somewhat connate at the base, with incurved margins; the outer to 23-24 mm long, 6.5-7 mm broad, apiculate, inner almost equal but lacking the apiculum; basal scales minute, lacerated. *Filaments* closely fasciculated, lateral episepal to 10-15 mm long, upper episepal ca. 11 mm long, lateral epipetal to 13 mm long, lower epipetal to 12 mm; *anthers* lunulate ca. 2 mm long. *Ovary* obovoid, obtusely trigonous, or sometimes almost cylindrical, ca. 3-9 mm long, 2-2.3 mm broad. *Style* curved, ascending, to 13.5-14 mm long; *stigma* shortly trifid, its divisions ca. 0.8-1.1 mm long, whitish or sometimes purple. *Capsule* globose-tricoccous, ca. 9 mm in diam. *Seeds* oblong, almost cuneate or sometimes semielliptic, black, with papyraceous edges.

A species with a wider distribution beyond the Patagonian region; it is somewhat rare here.

RHODOPHIALA PRESL

Presl, Bot. Bemerk.: 115. 1844.

1a. Stigma capitate or capitate-trilobed. Spathe always one-flowered:
  2a. Longer stamens ca. 12 mm. Flower upright ....1. *andicola*
  2b. Longer stamens ca. 16-26 mm long. Flowers cernous. 2. *rhodolirion*
1b. Stigma trifid. Spathe 2-6-flowered:
    3a. Flowers a lemon yellow. Anthers ca. 3.5-5 mm long. Bulb to 3.8-6 cm long ....3. *mendocina*

3b. Flowers reddish to yellow. Anthers ca. 2-3 mm long. Bulb to 2.7-2.8 cm long ....4. *araucana*

Rhodophiala andicola (Poepp.) Traub, Pl. Life 9: 60. 1953.; *Amaryllis andicola* Poeppig, Fragm. Syn. Pl. Phan.: 5. 1833.; *Habranthus andicola* (Poepp.) Herbert, Amaryll.: 168. 1837.; *Hippeastrum andicolum* (Poepp.) Baker, Handb. Amaryll.: 36. 1888.; *H. purpuratum* Philippi, *Anal. Univ. Chile* 93: 156. 1896.; *Amaryllis purpurata* (Phil.) Traub & Uphof, *Herbertia* 5: 131, 1938.; *Rhodophiala purpurata* (Phil.) Traub. *Pl. Life* 9: 60. 1953.

Plant to 17-25 cm tall. *Bulb* ovoid about 3.5 cm long, 2-2.8 cm wide, with dark brown coats; pseudo-neck ca. 8 cm long. *Leaves* ca. 15-30 cm long, 2.5-5 mm broad, channelled, a dark green, often pruinose, obtuse. *Scape* 12-20 cm long. *Spathe* one-flowered, with or without a linear bract inside, free to the base. *Flower* ca. 35-42 mm long, 26-38 mm in diameter, sometimes almost sessile (pedicel 1-4 mm long), upright, purple passing to whitish downwards, the throat a purplish-black. *Tepals* connate for 5-9 at the base, oblanceolate, the outer about 20-37 mm long, 6.8-8 mm broad, inner to 35 mm long, 9 mm broad. *Stamens* only slightly declined, very short (the longer ca. 10-11 mm); *anthers* lunulate; basal scales absent. *Ovary* oblong about 5 mm long, 3 mm broad. *Style* ca. 28 mm long; *stigma* capitate-trilobed. *Capsule* globose-tricoccous ca. 26 mm in diam. *Seeds* semicircular or oval-deltoid, black, papyraceous ca. 8.5-11.5 mm long, 6.5-9 mm broad.

An inhabitant of the Andean-Patagonian region; is also found in Chile. It grows in sandy soil, often in the top of mountains.

Rhodophiala rhodolirion (Bak.) Traub. *Pl. Life* 9: 60. 1953.; *Hippeastrum rhodolirion* Baker, Trimen *Journ. Bot.* 16: 83. 1878.; *Rhodolirion montanum* Philippi, *Linnaea* 29: 65. 1857-58.; *Rh. andinum* Phil. *loc. cit.*

Plant to 14-20 cm tall. *Bulb* about 4-5.7 cm long, 3.2-4.3 cm wide, covered with dark brown coats; pesudo-neck ca. 7.5-12.5 cm long. *Leaves* absent or incipient at anthesis, ca. 2.2-3.2 mm broad. *Scape* 3 mm broad. *Spathe* one flowered; valves almost equal, to 3.3 mm long; inner bract linear ca. 2.4 cm long. *Flower* cernuous, a bright carmine-pink, with blackish streaks and points, and a yellowish green throat, about 3.5-4.5 cm long, 3-4 cm in diam. *Pedicels* to 0.9-9 mm long, occasionally longer. *Tepals* connate for 6-12.5 mm, recurved; the outer ca. 3-4.6 mm long, 6.5-9.5 mm broad, the inner somewhat narrower. *Filaments* declinate-ascending, lateral episepal ca. 13-22.5 mm long, upper episepal to 14-23.5 mm, lateral episepal pair ca. 15-25 mm long, lower epipetal 16-26 mm long; *anthers* reniform or semilunate, ca. 3.5-4 mm long. *Style* to 36-52 mm long; *stigma* capitate, obscurely trilobed, ca. 1 mm in diam.

Habranthus punctatus in the sense of Philippi (Gartenflora 33: tab. 1163, f.3, 1884), is a decolored form of this species. *Rhodophiala maculata* (L'Her.) Rav. and *Rh. uniflora* (Phil.) Traub, are probably earlier names. The latter was found by Philippi near the coast, in the province of Atacama. This should be not surprising; in fact, the species here described was recently gathered in the mountains of Coquimbo (Chile), much northwards from the places hitherto known for the plant.

Rhodophiala mendocina (Phil.) Ravenna, Pl. Life 26: 87. 1970.; *Habranthus bagnoldianus* Herb. var. *gilliesianus* Herbert, Amaryll.: 163, tab. 23, f. 1. 1837.; *Hippeastrum elwesii* C. H. Wright, Kew Bull. 1914: 330.; *Rhodophiala elwesii* (C. H. Wr.) Traub, Pl. Life 12: 60. 1953.

Plants ca. 28 cm tall. *Bulb* often large, globose or ovoid-globose, to 6-7 cm long, 6 cm in diam.; pseudo-neck ca. 14-15 cm long. *Leaves* slightly channelled, pruinose, obtuse, about 20 cm long, 6-9 mm broad. *Spathe* 2-6-flowered: valves membranous, ca. 3-6.5 cm long; inner bracts several. Flowers erect yellows. *Perigone* funnel-shaped, to 42-43 mm long. *Tepals* oblanceolate, connated at the base; the outer acute ca. 39 mm long, 8.4 mm broad, the inner obtuse, slightly shorter, ca. 37 mm long, 6 mm broad. *Stamens* slightly declined, much shorter than the perigone; *anthers* versatile semilunate. *Ovary* oblong to 5-5.5 mm long, 3.1 mm broad. *Style* declined, longer than the stamens, ca. 30 mm long; *stigma* trifid.

From the province of Mendoza, through La Pampa, southwards to Patagonia.

Recent studies revealed that *Rh. elwesii* is a synonym of this species. *Habranthus bagnoldianus* Herb. var. *gilliesianum* Herb. is also the same, as a photograph from the type had demonstrated. The latter is said that was found by Gillies at Melocotón, supposedly in Chile (see G. H. Card Index 5: 257). In fact, there is a village with this name in the province of Santiago, not far from the capital of that country. Nevertheless, the species was never collected again in Chile, and my attempts of finding it in Melocotón, and neighbouring areas, failed. For this reason, it was thought that this record could be a mistake, and that Gillies might had collected the specimens in Mendoza, rather than in Chile.

Prof. Ruíz Leal, from the University of Mendoza, says that there are two places in his province, which bear the name of Melocotón: a village and a hill. The former had apparently been named lately. The latter, properly named "Cerro del Melocotón", bears such a name from early times. It belongs to the department of San Rafael, and was on Gillies route. According to the facts exposed, the Cerro del Melocotón, in Mendoza, should be regarded as the original place where *Habranthus bagnoldianus* var. *gilliesianus* was found. Therefore, *Rhodophiala mendocina* is exclusively from Argentina. I am indebted to Prof. Ruiz Leal for the information which helped to clear up this point.

Rhodophiala araucana (Phil.) Traub, *Pl. Life* 12: 60. 1953.; *Hippeastrum araucanum* Philippi, *An. Un. Chile* 93: 152. 1896.; *Amaryllis araucana* (Phil.) Traub & Uphof, *Herbertia* 5: 130. 1938.

Plant to 22 cm tall. *Bulb* ovoid ca. 2. 5-3 cm long, 1.6-1.7 cm broad. *Leaves* present at anthesis, to 9-16 cm long, 3-5.5 mm broad, flattened, often falcate. *Scape* cylindrical, ca. 17 cm long, 2-3 mm broad. *Spathe* two-flowered, with 1-2 filiform inner bracts. *Flowers* erect or slightly cernuous, reddish to yellow. *Perigone* ca 3.2-3.3 cm long, funnel-shaped. *Tepals* oblanceolate, connate at the base, the outer ca. 3 cm long, 6.5 mm broad, apiculate, the inner ca. 2.7 cm long, 6 mm broad, acute. *Stamens* declined, shorter than the perigone. *Anthers* versatile, semilunate, to 3 mm long. *Ovary* oblong, ca. 4.5 mm long, 2.4-2.5 mm broad. *Style* to 2.5 mm long; *stigma* trified.

Known only from the region of Copahue, in Neuquen, and the pass of Cupullhue (the border), not far from the former village.

PELARGONIUM LEAF AND ROOT CUTTINGS

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In landscaping the grounds of a new home, many plants of the dwarf, closely-branching Nutmeg Geranium, *Pelargonium* x *fragrans* Willd., were required as edging plants. One many-branched plant was available for propagation material. It was easy to remove the very short branches which rooted readily, but this did not produce a sufficient number of plants in a reasonable time. Experimentation revealed that firm, *immature* leaves snapped off close to the stem, when placed lower end shallowly in peat moss kept moist, first rooted profusely and then put out sprouts. In this manner the required large number of plants was obtained in a reasonable time. This brief note is published for those who may be confronted with a problem similar to the one which faced the writer.

Experimentation also established that *Pelargonium* x *fragrans* roots readily from root cuttings. The many-branched plant, referred to above, was removed by cutting the roots in a circle near the plant stem, leaving the roots in the ground. After about six weeks sprouts appeared from the cut ending of the roots. In this way 35 sprouting plants were harvested. Apparently more may sprout from the same cut root endings.

Helen Van Fleet Wilson, in ''The Joys of Geraniums'' (1965), M. Barrows & Co., New York, does not mention leaf and root cuttings in connection with Pelargoniums.

It is known that the Rose Geranium, *Pelargonium graveolens* L'Herit., spreads extensively by sprouting from the roots, and thus may become invasive. The extent of this phenomenon among the other *Pelargonium* species is not known at present to the writer.

PLANT LIFE LIBRARY—continued from page 5.

HERBALS: THEIR ORIGIN AND EVOLUTION, 1470—1670, by Agnes Arber. Facsimile of the 1938 edition, with preface to the reprint edition by Muriel A. Arber. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1970. Pp. 326. Illus. Characterized by the author as a chapter in the history of botany, this profusely illustrated classic, which has been out of print for some time, is now again available. The text is written in a concise and lucid style by the late Agnes Arber. The chapters are concerned with the early history of botany, the earliest printed herbals, the early herbals of England, the botanical renaissance of the 16th and 17th centuries, the evolution of the art of plant description, plant classification, the art of botanical illustrations, the doctrine of signatures and astrological botany, and conclusions. Appendices I, II and III and an index complete the volume. This charming book by an outstanding authority in this field is required reading for all interested in plant life. Most highly recommended.

FLORA NEOTROPICA, Monograph No. 2. BRUNNELIACEAE, by Jose Cuatrecasas, (Phamphlet issued Aug. 21, 1970), and MONOGRAPH NO. 3, OMPHLEALINAE (CLITOCYBEAE—TRICHOLOMATACEAE BASIDIOMYCETES), by Rolf Singer; MONOGRAPH NO. 4, PHAEOCOLLYBIA (CORTINARIACEAE BASIDIOMYCETES), by Rolf Singer, and MONOGRAPH NO. 5, STROBILOMYCETACEAE (BASIDIOMYCETES) by Rolf Singer (Nos. 3, 4 and 5 in Pamphlet issued Oct. 1, 1970). All published for the Organization for Flora Neotropica, by Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. A periodical designed to present in monographic form taxonomic accounts of all plants growing within the Western Hemisphere tropics. Geographic, ecologic, cytologic, ananomic, morphologic, chemical and economic data are presented as well as bibliography, citations of species names and indices, for each group treated. Highly recommended to all interested in the flora of the New World tropics.

THE BIOLOGY OF THE HIGHER CRYPTOGAMS, by William T. Doyle. Macmillan Co., 866 Third Av., New York, N. Y. 10022. 1970. Pp. 163. Illus. Paper covers. This important new book is designed to give the student an indepth view of the principal aspects of mosses, liverworts, ferns, horsetails and club mosses. The chapter headings provide an inventory of the subjects covered—an introduction to higher cryptogams, life cycle, adaptations to life on land, diversity, and special topics. This concise, informative text is very highly recommended.

THE METHOD OF SCIENCE, by R. Harre. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1970. Pp. 120. Illus. $3.50 (paper covers). This is one in the Wykeham Series which aims to broaden the outlook of the advanced high school student, and introduce the undergraduate to the present state of science as a university study. The subject matter is elaborated under the following chapter headings—science before Copernicus; the magical tradition and atomism; early history of magnetism; William Gilbert; origins of the knowledge of plants; early modern ideas on the life of plants; the life of Stephen Hales; the sap; the air; and vegetable life. Very highly recommended.

HOW TO GROW ORCHIDS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1970. Pp. 64. Illus. Paper covers, $1.95. This concise, popular treatise on the culture of orchids is presented with a wealth of illustrations. The chapters are concerned with the great diversity and appeal of the orchids; the requirements for healthy growth; indoor culture; culture in the garden; propagation; utilization of the flowers; specialties, and an index. Very highly recommended to all gardeners.

NEW KINGDOMS, SUBKINGDOMS AND PHYLA OF ORGANISMS

HAMILTON P. TRAUB

It is now widely recognized that the procaryotic and eucaryotic cellular organization represents a profound structural and developmental discontinuity in biology (Chatton (1937); Doughtery (1957); Stanier, Doudoroff and Adelberg, 1963, 1970; Stanier, 1970). Thus it is no longer tenable to include the bacteria and blue green procaryotes (ex blue green algae) under one of the so-called kingdoms along with other organisms which are eucaryotes. On a cellular basis there are two kingdoms—the procaryotes or *Procaryotae* and eucaryotes or *Eucaryotae* (Traub, 1964). In line with the recognition of these facts, a new arrangement of living organisms has been proposed (Traub, 1964). For the sake of completeness, it appears to be useful to typify these lineagic groups (taxa).

It has been customary *not to typify* the names of taxa above the rank of family. This was logical as long as the basic features on which to base these ranks were obscure. Now that the subject has been clarified by the concept of *procaryotic* and *eucaryotic* organisms, there is no longer any doubt since the cellular organization goes to the root of the problem and offers a sound basis for the primary grouping of organisms, and there appears to be no longer any probability that this outlook will be modified, except in details, in the future. The typification of the taxa above the rank of family in this report is based on the following rules:

> Nomenclatural types above the rank of family. The nomenclatural type (or more accurately, the name bearer or nomenifer) of a phylum (division) or any taxon between phylum (division) and family is a family, that of a kingdom or any taxon between kingdom and phylum (division) is a phylum (division). In order to avoid unnecessary name changes, and for other obvious reasons, the name of the group typified above the rank of order, need not necessarily be based on the name of the type (nomenifer) chosen.

The typification of the names of the primary taxons will serve the useful purpose of eliminating such differences in spelling as *Prokaryotae* for *Procaryotae* and *Eukaryotae* for *Eucaryotae*.

Kingdom 1. **Procaryotae** Traub, **reg. nov.** Res vivae cellulis procaryoticis. (Cf. Plant Life 19: 160. 1963 & Lineagics, p. 141. 1964, anglise.) Typus: Phylum **Cyanobacae** Traub. Organisms with the procaryotic cellular organization. **Lysine synthesis is through the intermediate** α, **E-diaminopimetic acid (DAP) path.** (Vogel et al. 1970)

  Subkingdom 1. **Autobacae** Traub, **subreg. nov.** Res vivae procaryoticae autotrophicaeque et neoheterotrophicae affines. cf. Traub, Lineagics, pp. 132, 141. 1964, anglise. Typus: Phylum **Cyanobacae** Traub. Autotrophic procaryotic organisms and related neoheterotrophs.

    Infrakingdom 1. **Chemoautobacae** Traub, **infrareg. nov.** Procaryotic organisms; obligate and facultative chemoautotrophs; and related neoheterotrophs. cf. Traub, Lineagics, 1964, pp. 132, 141-142. Typus:

Phylum **Autonitrobacae** Traub.

Phylum 1. **Autonitrobacae** Traub, **phylum nov.** Res vivae obligato-chemo-autotrophicae compositiones nitrogenias inorganicas per energiae origines et CO_2 per carbonis solam originem usurpentae. cf. Traub, Lineagics, 1964, p. 141. Typus: Family **Nitrobacteraceae.** Obligate chemoautotrophs that utilize inorganic nitrogen compounds as energy sources, and CO_2 as the sole source of carbon.

Phylum 2. **Autohalobacae** Traub, **phylum nov.** Res. vivae obligato-, vel facultato-chemo-autotrophicae per energiae origines in fixatione carbonis aut sulphurem elementale aut compositiones sulphuricas inorganicas vel compositiones ferreas usurpentae. Typus: Family **Thiobacillaceae.** cf. Traub, Lineagics, 1964, pp. 141-142. Obligate or facultative chemoautotrophs utilizing elemental sulfur, or inorganic sulfur compounds, or ferrous iron compounds, as sources of energy in fixing carbon.

Phylum 3. **Hydrogenobacae** Traub, **phylum nov.** Res vivae facultato-chemo-autotrophicae energiam de H_2-oxidatone in fixatione carbonis usurpentae. Typus: Family **Hydrogenomonaceae,** cf. Traub, Lineagics, 1964, p. 142. Facultative chemoautotrophs utilizing energy from the oxidation of H_2 in fixing carbon.

Phylum 4. **Methanobacae** Traub, **phylum nov.** Res vivae obligato-chemo-autotrophicae per carbonis energiaeque originem CH_2 usurpentae. Typus: Family **Methanomonaceae,** cf. Traub, Lineagics, 1964, p. 142. Obligate chemoautotrophs utilizing methane (CH_2) as the source of carbon and energy.

Infrakingdom 2. **Photoautobacae** Traub, **infrareg. nov.** Procaryotic organisms; obligate or facultative photoautotrophs, and the related neoheterotrophs. cf Traub, Lineagics, 1964, pp. 132-133; 142. Typus: Phylum **Cyanobacae** Traub.

Phylum 5. **Chlorobacae** Traub, **phylum nov.** Res vivae anaerobo-photo-autotrophicae chlorobio-chlorophylla contientes et CO_2 per carbonis originem et H_2S per redacto-potentiam originem usurpentes. Typus: Family **Chlorobiaceae.** cf. Traub, Lineagics, 1964, p. 142. Anaerobic photoautotrophs, containing chlorobium chlorophylls, using CO_2 as the carbon source, and H_2S as the source of reducing power.

Phylum 6. **Chromobacae** Traub, **phylum nov.** Res vivae anaerobo-photo-autotrophicae bacterio-chlorophyllum continentes. Typus: Family **Chromatiaceae.** cf. Traub, Lineagics, 1964, p. 142. Anaerobic photoautotrophs containing bacteriochlorophyll.

Phylum 7. **Cyanobacae** Traub, **phylum nov.** Res vivae procaryotices obligato-, vel facultato-photo-autotrophicae α-chlorophyllum continentes, endomembrana non circumsistentae. Typus: Family **Nostocaceae** (Naegeli) Rabenhorst. Procaryotes; obligate or facultative photoautotrophs containing α-chlorophyll, not surrounded by an endomembrane. cf. Traub, Lineagics, 1964, p. 142.

Subkingdom 2. **Heterobacae** Traub, **subg. nov.** Res vivae procaryoticae heterotrophicaeque. Typus: Phylum **Eubacae** Traub, cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes.

Phylum 8. **Myxobacae** Traub, **phylum nov.** Res vivae procaryotices heterotrophicae unicellulares bacilliformes non-flagelliter prolapses moventes. Typus: Family **Myxobacteriaceae,** cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; unicellular, cells rod-shaped, with gliding nonflagellar movement.

Phylum 9. **Spirochetobacae** Traub, **phylum nov.** Res vivae procaryotices unicellulares spirilliformes. Typus: Family **Spirochaetaceae,** cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; unicellular; cells spiral-shaped.

Phylum 10. **Eubacae** Traub, **phylum nov.** Res vivae procaryotices plerumque unicellulares interdum filamentosae vel myceliales, cellulis sphaericis vel bacilliformibus vel heliciformibus. Typus: Family **Bacillaceae**, cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; mostly unicellular, sometimes filamentous or mycelial; cells spherical, rod-, or helical-shaped.

Kingdom 2. **Eucaryotae** Traub, **reg. nov.** (cf. Plant Life 19: 160. 1963, and Lineagics, 1964, pp. 145—147, anglise.) Res vivae cellulis eucaryoticis. Typus: Phylum **Chlorophyta**. Organisms with the eucaryotic cellular organization.

Subkingdom 1. **Plantae.** Obligate or facultative photoautotrophs containing α-chlorophyll as the main photosynthetic pigment; and related neoheterotrophs. cf. Traub, Lineagics, 1964, pp. 143—144. Typus: Phylum **Chlorophyta.**

Infrakingdom 1. **Anembryophytae** Traub, **infrareg. nov.** Unicellular and multicellular non-embryobearing eucaryotic organisms. cf. Traub, Lineagics, 1964, p. 143. Typus: **Chlorophyta.**

Province 1. **Euglenophytiae** Traub. Euglenoids. **Lysine path through the intermediate α-aminopimelic acid (AAA) path.** (Vogel et al., 1970.) Phylum 11. **Euglenophyta.**

Province 2. **Chromophytiae** Traub. Non-grass-green algae. Phyla 12 through 15: **Rhodophyta, Paeophyta, Chrysophyta** and **Pryyophyta. Lysine paths not determined.**

Province 3. **Chlorophytiae** Traub. Grass-green algae. **DAP lysine path.** Phylum 16. Chlorophyta.

Infrakingdom 2. **Embryophytae** Traub. Embryo-bearing plants. **DAP lysine path.** Typus: Phylum **Tracheophyta.**

Phylum 17. **Bryophyta.** Non-vascular embryophytes.

Phylum 18. **Tracheophyta.** Vascular embryophytes.

Subkingdom 2. **Heteroplantae** Traub, **subreg. nov.** Res vivae eucaryoticae inter plantas et animales characteribus mediae. Typus: Phylum **Eumycota** Engler, in Syllab. ed. 3. 25. 1903. Eucaryotic organisms (mesoheterotrophs) intermediate between **Plantae** and **Animalia.** cf. Traub, Lineagics, 1964, pp. 144—145. Fungi (mesoheterotrophs): unicellular, plasmodial and multicellular plant-like parasites and saprobes.

Infrakingdom 1. **Gymnomycotae** Traub, **infrareg. nov.** Naked fungi or slime moulds. Organisms without cell walls; somatic phase consisting of simple uninucleate amoebae, or of a multinucleate plasmodium. Typus: **Myxomycota** Haeckel, 1866. cf. Traub, Lineagics, 1964, pp. 144—145. **Lysine paths not determined.**

Phylum 19. **Communomycota** Traub **phylum nov.** Res vivae eucaryotices heterotrophicae communales; aggregationes amoebarum distinctarum pseudoplasmodium communale ante sporarum formationem facientes; reproductione asexuali per devorationem amoebae unicae per amoebam aliam et postea per nucleorum. Typus: Family **Sappiniaceae.** Communal eucaryotic heterotrophs; aggregations of distinct amoebae into a communal pseudoplasmodium preceding spore formation; asexual reproduction is by "engulfment of one amoeba by another" and subsequent fusion of the nuclei. cf. Traub,

Phylum 20. **Reticulomycota** Traub, **phylum nov.** Res vivae heterotrophicae eycaryotices parasiticae vel saprobiticae, structura somatica simplici, cellulis ovalibus vel raro fusiformibus, filamenta mucosa conjungentes et reticulum tenuissimum facientes in qua cellulae prolapses secernentibus; reproductione sexuali non demonstratus. Typus: Family **Labyrinthulaceae.** Heterotrophic eycaryotes; parasites and saprobes; somatic structure simple, oval, or rarely spindle-shaped cells, secreting mucous filaments which unite to form a fine net-work on which the cells glide; sexual reproduction has not been demonstrated. cf. Traub, Lineagics, 1964, p. 144.

Phylum 21. **Myxomycota** Haeckel (1866). Plasmodial slime moulds. Typus: Family **Liceaceae** Rost. cf. Traub, Lineagics, 1964, pp. 144—145.

Infrakingdom 2. **Eumycotae** Traub, **infrareg. nov.** True Fungi. Organisms provided with cell walls, with few exceptions; usually filamentous, rarely unicellular; reproducing sexually and asexually. cf. Traub, Lineagics, 1964, p. 145. Typus: Phylum **Eumycota** Engler.

Phylum 22a. **Oomycota** Traub, **phylum nov.** ("Phycomycetes" Group 1a) Water moulds, white rusts and downy mildews (cf. Class 3, subphylum 1. **Sporangimycotina** in part, Traub, Lineagics, 1964, p. 145.) Cell walls of cellulose; sporangium-bearing fungi; **DAP lysine path.** cf. Vogel et al., 1970. Typus: Family **Saprolegniaceae** Kuenzig, Phy. Gen. 157. 1843.

Phylum 22b. **Hypochytrimycota**, Traub, **phylum nov.** ("Phycomycetes" Group 1b) Sporangium bearing fungi; cell walls do not show a cellulose reaction. **DAP lysine path** (cf. Vogel et al., 1970). Typus: Family **Hypochytriaceae** Fisher (1892).

Phylum 22c. **Eumycota** Engler, in Syllab. ed. 3. 25. 1903. Cell walls with fungus chitin predominating. **AAA lysine path** (cf. Vogel et al., 1970).

Subphylum 1. **Sporangimycota.** ("Phycomycetes" Group 2) Sporangium-bearing fungi, including classes **Chytridiomycetes, Plasmodiophoromycetes, Zygomycetes** and **Trichomycetes.**

Subphylum 2. **Conidimycota.** Conidia-bearing fungi, including classes **Ascomycetes** and **Basidiomycetes.**

Subkingdom 3. **Animalia.** Eucaryotic organisms (archiheterotrophs), usually ingesting materials from which elaborated food is absorbed. For tentative subdivisions, including Phyla 23 through 46, see Traub, Lineagics, 1964. pp. 145—147. **Capacity for lysine synthesis lost.**

LITERATURE CITED

Chatton, E. Titres et travaux scientifiques. Sète: Sottano. 1937.

Dougherty, E. C. Neologisms needed for structure of primitive organisms. J. Protozool. 4: (suppl.), p. 14. 1957.

Stanier, R. Y. Some aspects of the biology of cells and their possible evolutionary significance. **In,** H. P. Charles and B. C. J. G. Knight (eds.) Organization and control in Prokaryotic and Eukaryotic cells. Cambridge Univ. Press. 1970. **pp. 1—38.**

Stanier, R. Y., M. Doudoroff & E. A. Adelberg. The microbial world. 1st ed. 1957; 2nd ed. Prentice-Hall. 1963; 3rd ed. 1970.

Traub, Hamilton P. Lineagics. 1964.

Vogel, H. J., J. S. Thompson & G. D. Shockman. Characteristic metabolic patterns of Prokaryotes and Eukaryotes, **In** H. P. Charles, and B. C. J. G. Knight (eds.) Organization and control in Prokaryotic and Eukaryotic cells. Cambridge Univ. Press. 1970, **pp. 107—119.**

NEO-BESSEYAN OR SYNTHETIC EVOLUTIONARY LINORDINATION OF FLOWERING PLANTS[1]

HAMILTON P. TRAUB

In the past attempts have been made by a single worker, or limited group of workers, to achieve a satisfactory grouping in the most difficult field of flowering plants. But it has been clear for many years that such a grouping has to rest on the combined work of a great many researchers in phytomorphology, paleophytology, caryology, embryology, phytochemistry, etc. Such information has been accumulating since the time of Alexander Braun (1875), Bessey (1897, 1915) and Hallier (1912). These researches are far from completed in all of the required phases, but the time will surely come, perhaps within our life time, when such a synthesis based on a consensus will be possible. It is in this context that students of angiosperm evolution, dispersal and linordination will be grateful to Mr. Jeffery, the translator, and the publishers, of this fine English edition of Dr. Takhtajan's 1961 Russian text on "Flowering Plants: Origin and Dispersal", which has been revised and brought up-to-date.

Before considering Dr. Takhtajan's book, it is worthwhile to note that linordination of organisms is now in its third historical period (Traub, 1964; 1970). Within a decade after the appearance of Linnaeus' *Species Plantarum* (1753), the outlook of the first or static typological period was challenged. Linnaeus was a prisoner of the scholastic past and his static opus led into a dead-end street or cul-de-sac from which there was no return.

The beginning of the end of the static typological period was sounded with Adanson's *Histoire naturelle du Senegal* (1757), and more definitively with his *Familles des Plantes* (1763-64), when he effectively ushered in empiricism in lineagics and with it the second or Adansonian period. Adanson's multivariate method which emphasized taking into consideration all of the features of organisms in the process of linordination, was a great advance over typology, but it was without the insight of the principles of *homology, parallelism* and *convergence.*

The deficiencies inherent in the Adansonian multivariate method were gradually overcome in the third, or contemporary evolutionary period under the umbrella of Darwin's theory of bioevolution, which was first enunciated in its elemental form in 1859. This supplied a minimum basis for a workable theory. Since that date, particularly since 1937, a more comprehensive *synthetic theory* has been gradually worked out by the combined effort of many workers in genetics and population theory, resulting in a nearly complete consensus and this is the heart of contemporary lineagics. It is fortunate that this is so, and that typological thinking is now nearly absent in linordination. But workers have to be forever on guard. The recent revival of the Adansonian multivariate method under the new name, *numerical taxonomy,* at first confused the issue since some of the early advocates made wild claims indicating a reversion to the unmodified Adansonian multivariate method. They had not read the lessons of the history of the first and second periods (Traub, 1964). Fortunately the wild claims soon died down under constructive criticism, and at present the method is considered as a mathematical procedure (a branch of biometry or phylometry) which is an aid and not the sole solution of the problem of grouping lineages (Traub, 1964, Cole, 1969). Thus, it is fortunate that at least in methodology there is a near consensus with reference to procedure in lineagics.

Following the first grouping of plant genera into families together with adequate descriptions of these phylons by Adanson (1763-64), many workers have had a hand in delimiting plant families, and a considerable consensus has been achieved at this level. Much progress has also been made toward grouping families into orders, but here the consensus is less in evidence. The still further synthesis toward grouping orders into superorders has only begun, and a consensus concerning these phylons is not yet in sight.

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[1] Flowering Plants: Origin and Dispersal, by Armen Takhtajan, translated from the Russian by C. Jeffrey. Smithsonian Institution Press, Washington, D. C. 20560. 1969. Pp. 310. Illus. $6.95.

One of the most pressing problems still to be solved concerns the origin of the flowering plants. The extreme radiation of the angiosperms is relatively recent, and thus the very great diversity of living linons complicates matters. The other and older subgroups of the Phylum Tracheophyta have been decimated and more, and the living linons are fewer. Perhaps, such new tools as the determination of amino acid and nucleotide sequences (Fitch & Margoliash, 1970) for representatives of the living linons of the subgroups of the Phylum Tracheophyta could illuminate the subject. Nucleotide sequences are rather difficult and very expensive to perform, but the determination of amino acid sequences may be practicable if these should show sufficient divergences in the representative linons of the Phylum Tracheophyta.

Basing his conclusions on the accumulated fund of knowledge about higher plants, the author attempts a synthesis toward an understanding of the evolution of the flowering plants, but admits that "much is uncertain and much is in dispute." Due to space limitations, he rules out a critical review about the "many different hypotheses of the origin of flowering plants", and he has to content himself with "stating, and as far as possible substantiating, ideas and concepts that seem to . . . (him) to be correct or at least plausible."

After a brief introduction, the author asks the question whether the flowering plants are polyphyletic? His answer is that they are monophyletic in the sense that they arose from a single linon or a phylon of lower rank, which "is demonstrated above all by their multiple of common morphological characters."

The next question is directed to the ancestors of the angiosperms, and it is concluded that they arose from some very ancient phylon of gymnosperms with "primitive secondary xylem and scalariform tracheids at least in the early wood, and primitive strobili."

The unsolved problem of the absence of fossil remains of the earliest flowering plants is considered. It is postulated by a number of workers that this absence is due to the evolution of these plants in mountain habitats where the possibilities for the preservation of fossils is unfavorable. In such habitats smaller isolated populations are usually found and in these there is a tendency for speedy evolutionary radiation. This may be further accelerated by the change from the "primitive haphazard pollen transfer to pollination exclusively by a particular insect (or other pollinator)."

With the background of the probable "evolutionary pathways of angiosperms", the author extrapolates a hypothetical reconstruction of the first flowering plants based on a study of the present day "primitive" angiosperms, mainly in the Order Magnoliales. Here there appears to be greater diversity of opinion, particularly with reference to the origin of such organs as the stamens. Meeuse (1966), and his followers, consider such an approach as too simplistic, and bordering on typology, and using the same data come to directly opposite conclusions. Thus a consensus is not yet in sight.

With reference to the apetalous dicotyledons, which were misinterpreted by the Englerians lineagicists, it is concluded, in harmony with most other recent workers (Braun, 1875; Bessey, 1897, 1915; Hallier, 1912, and others), that the so-called "Amentiferae" are "a very heterogeneous and artificial assemblage in which taxa of different origins have been included." Here a near consensus has been reached.

Theophrastus (ca. 322 B. C.) noted the difference between the seedlings of the dicotyledonous legumes and the monocotyledonous grains. This theme was further elaborated by Albertus Magnus (ca. 1256) and Ray (1682, 1703), and there appears to be a virtual consensus about the nature of these groups today. The author agrees with the hypothesis that the monocots arose from the dicots. The concluding chapters are devoted to the fossil remains of the angiosperms; the tropical origin of the flowering plants; the origin of the temperate flora, and the Cretaceous and Tertiary floras.

Appendix I is in the nature of a brief summary of the author's linordination of the flowering plants. For further details the author directs the reader to his text, *"A System and Phylogeny of the Flowering Plants"* (Russian), Leningrad. 1967. Appendix II is devoted to the floristic regions of the world. A bibliography and index complete the volume.

Appendix I, grouping of the flowering plants, deserves further attention. Under each of the two classes—dicots and monocots—the author recognizes subclasses, superorders, orders and families. Under dicots there are 7 subclasses, 15 superorders, and 74 orders. Under monocots there are 4 subclasses, 5 superorders and 20 orders. Such a grouping of subclasses and superorders can be only preliminary since a consensus has not as yet been achieved at these levels.

Figure 31 may be misleading. The branching appears all too simplistic. It is hardly possible that all other angiosperms branch from the Magnoliales as recognized today. If the time factor were recognized, the branching could be shown as originating from primitive ancestors which might have differed markedly from the present day Magnoliales. Such a gap could then be filled in later if, and when, fossil remains of early angiosperms should be discovered. This also points up the danger of changing names of the classes dicots and monocots to ones with generic basis—Magnoliatae and Liliatae. At that high level generic bases are better left out in favor of age-old names.

The author is to be congratulated on a concise and clearly written text which the reviewer enjoyed reading. American workers will be grateful to Dr. Takhtajan for clearly indicating his outlook on the grouping of the flowering plants. It is only by the exchange of such detailed viewpoints of various workers that a consensus will eventually be reached about the linordination of the flowering plants.

In closing, may the hope be expressed that Dr. Takhtajan's *"A System and Phylogeny of the Flowering Plants"* (Russian), Leningrad, 1967, will also soon be published in an English Edition.

REFERENCES

Adanson, Michel. Histoire naturelle du Senegal: Couquillages. Paris. 1757.

——. Familles des Plantes. 2 vols. Chez Vincent. Paris. 1763-64.

Bessey, C. E. Phylogeny and taxonomy of the angiosperms. Bot. Gaz. 24: 145—178. 1897.

——. The phylogenetic taxonomy of flowering plants. Ann. Missouri Bot. Gard. 2: 109—164. 1915.

Braun, Alexander. Die Frage nach d. Gymnospermie d. Cycadeen erlaeurtert durch die stellung dieser Familie im Stufengang des Gewaechsreichs. Mber. dt. Akad. Wiss. Berlin. 241—267, 289—377. 1875 (1876).

Cole, A. J. (editor). Numerical Taxonomy. Academic Press, New York. 1969.

Delevoryas, Theodore. Morphology and Evolution of Fossil Plants. Holt, Rinehart & Winston. New York. 1962.

Fitch, Walter M. and Emanuel Margoliash. The usefulness of amino acid and nucleotide sequences in evolutionary studies. pp. 67—109, In, Dobzhansky et al. (eds.) Evolutionary Biology, Vol. 4. Appleton-Century-Crofts. New York. 1970.

Hallier, H. L'origine et le système phylétique des Angiospers exposés a l'aide de leur arbe généalogique. Arch. néerl. Sci., sér. 2. 1: 146—234. 1912.

Meeuse, A. D. J. Fundamentals of Phytomorphology. Ronald Press Co., New York. 1966.

Traub, Hamilton P. Lineagics. La Jolla, Calif. 1964.

——. Introduction to Herbert's "Amaryllidaceae, etc. 1837 and related works", pp. 93, In, Wm. Herbert, Amaryllidaceae with Introduction by H. P. Traub, facsimile reprint. Verlag von J. Cramer, 3301 Lehre. West Germany. 1970.

PLANT LIFE LIBRARY

ESSAYS IN EVOLUTION AND GENETICS IN HONOR OF THEODOSIUS DOBZHANSKY, edited by Max K. Hecht and William C. Steere. Appleton-Century-Crofts, New York. 1970. 594 pp., illus. $16.00. This book comprises a collection of sixteen essays on evolution and genetics by friends, colleagues and students of Professor Theodosius Dobzhansky, honoring him on the occasion of his 70th birthday. The list of contributors is formidable. Among the best known are: Ayala, Carson, Florkin, Ford, Gustafsson, Rensch, Simpson, Stebbins, Wallace, and White. There is a Foreword by a longtime colleague, Professor L. C. Dunn, and author and subject indexes.

For more than half a century Professor Dobzhansky has contributed brilliantly, steadily and significantly to biological progress, particularly to a synthesis of evolutionary concepts through the clever and ingenious use of genetics and cytology. Dobzhansky is no ivory tower scientist. His teaching credentials are of the best, and through his writings he has lucidly explained man's status in the biological world to his fellow scientists and the well-read layman, if not to the man in the street.

The first chapter by Levene, Ehrman, and Richmond is biographical, and devotes space to an entertaining account of a collecting trip by Dobzhansky and his students to Latin America, specifically the Amazon Basin of Colombia. It is comforting to learn that Prof. Dobzhansky puts on his trousers one leg at a time, in the manner of ordinary biologists, even though some of his more avid followers would have us believe otherwise. There is also a summary of Prof. Dobzhansky's scientific work, a career summary and a bibliography (1918-1969) of approximately 480 titles including at least six books, truly a prodigious output for one man.

The collection of essays under review is of high quality, and some are outstanding. Unhappily for those interested in plants, only two of the 16 essays are concerned with plant material. One of them, however, ("Variation and Evolution in Plants: Progress during the past twenty years" by Prof. G. Ledyard Stebbins) is probably worth the price of the book. The remainder of my remarks will be concerned with Professor Stebbins' contribution since the interests of readers of Plant Life are likely to be oriented in this direction as are my own.

In its field Prof. Stebbins' book, "Variation and Evolution in Plants," published in 1950 has proved to be one of the most stimulating, widely cited and quoted books of the present century. Stebbins' essay is essentially an updating of his book, and a self-assessment of his skill as a prognosticator in predicting the course of progress in the study of variation and evolution of plants over the past 20 years. Stebbins is fully competent in this do-it-yourself role. His grasp of current and past literature of evolution, genetics (classical and molecular), cytology and systematics is shared by few scholars, and he excels in articulation.

Not unexpectedly, Prof. Stebbins comes out with high marks when the results of his foresight are totaled. I can find only one instance where he has been forced to retract a statement made in 1950. In a discussion of "Rates of Mutation" Stebbins severely underestimated the vast reserve of hidden, genetic variability in populations of self-pollinated species of plants. Lack of appreciation of the significant amount of variation in self-pollinated species of plants was a pardonable mistake in 1950, considering the amount of information available. The recent studies of Allard, however, have shown that self-pollinated species have an enormous amount of latent variability, although this variability may not lead to the differentiation of higher categories in the plant kingdom as Prof. Stebbins has pointed out.

Of the approximately 14 main topics discussed by Stebbins there is only one with which I would mildly disagree. He takes a rather dim view of the usefulness of numerical taxonomy in tracing the pattern of relationships in higher organisms as opposed to traditional taxonomic methods. At least for insects and cultivated plants the techniques associated with numerical taxonomy have been used with some success. In **Cucurbita**, mango, avocado and perhaps others, Rhodes and Carmer have uncovered relationships not likely to have been brought to light by alternate means. Numerical taxonomy has the added bonus that researchers are apt to study their material more critically and more thoroughly in an attempt to uncover quantitative, meaningful relationships. On the other hand, the undisciplined use of the methods of numerical taxonomy can lead to the association of species that have no biological affinity, and the separation of others which are clearly, closely related (see B. L. Burt, I. C. Hedge and P.F. Stevens. Notes R. B. G. Edinb. 30: 141-158).

It does not take a crystal ball to predict that Prof. Stebbins recent contribution will stimulate discussion and inspire investigators, much as did his book of two decades ago. As a result, we can anticipate a steady increase in our store of knowledge, and our understanding of evolution and variation in plants.—**Thomas W. Whitaker**

PLANT AGRICULTURE. Readings from Scientific American, selected and introduced by Jules Janick, Robert W. Schery, Frank W. Woods and Vernon W. Ruttan. W. H. Freeman and Company, San Francisco. 1970. 246 pp. Clothbound $10.00, paperbound $4.95. Plant Agriculture presents a selection of 25 articles from past issues of the Scientific American. They are primarily concerned with plants in relation to agriculture in its broadest sense. Each article is by a competent authority and they are well written and profusely illustrated. The articles are organized into 5 categories as follows: (1) Agricultural Beginnings; (2) Plant Growth and Development; (3) Plant Environment; (4) Production Technology; (5) Food Needs and Potentials. Each category is preceded by an Introduction that serves to set the stage for the material that follows. The book is terminated by a section called "Biographical Notes and Bibliographies." Here are found biographical notes on the authors and bibliographies that will assist the motivated student to explore a given subject more fully. There is an adequate Index.

The authors do not suggest the specific niche this anthology is presumed to fill. It should be useful, however, as a supplement for beginning undergraduate courses in botany at the college level, for courses in Economic Botany, and for background reading for all agriculturally oriented courses. For the amateur plantsman and educated layman it could be a stimulating experience just to browse through the book.—**Thomas W. Whitaker**

PRINCIPLES AND METHODS OF PLANT BIOSYSTEMATICS, by Otto T. Solbrig. Macmillan Co., 866 Third Av., New York, N. Y. 10022. 1970. Pp. 226. Illus. This concise text with a new outlook on plant lineagics is long overdue. In the past, most texts on this subject were concerned mostly with the practical problems of linordination, the grouping of plants without benefit of fundamental principles, to the near exclusion of the heart of the problem which consists of basic lineagics, the background necessary for linordination, or grouping of plants. Dr. Solbrig is to be congratulated on being among the first to clearly and unmistakably make these distinctions in plant lineagics. The text is concise and to the point. In part one, the processes of linoniation (speciation) and the forces that control these are discussed. In part two, some techniques for the study of linons (species) are considered. It is refreshingly encouraging to obtain a text which one can wholly approve. The only wish one might have is that such a text could be expanded to include even a wider range of details. Dr. Solbrig's text cannot be too highly praised, and it is recommended to all lineagicists, and all interested in plants.—**Hamilton P. Traub**

THE MICROBIAL WORLD, 3rd Edition, by R. Y. Stanier, M. Doudoroff & E. A. Adelberg. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 873. Illus. $15.95. All biologists will be grateful for this 3rd Edition of this classic text by Stanier, Doudoroff and Adelberg. The recent marked changes in the outlook on biology are reflected in the reappraisal of the subject matter so that practically all of the content has been reorganized and rewritten thus making it really a new book. The features of the book include the presentation of a condensed summary of bacterial metabolism covering biosynthesis; the subject of the generation, transfer and regulation of energy; setting the material dealing with microbial diseases into the broader context of symbiotic relationships that involve micro-organisms; consideration of microbial growth, and a discussion of bacterial physiology; a new treatment of bacterial metabolism which involves the important area of molecular biology; five new chapters dealing with the constituent groups of bacteria and their properties; a new chapter on methods in microbiology; and the annotated bibliography of books and reviews at the end of each chapter. The illustrations are outstanding. The authors are to be congratulated on such an excellent text. This authoritative, profusely illustrated and stimulating text cannot be too highly praised, and should be in the possession of all interested in biology for ready reference.

CONTROL MECHANISMS IN PLANT DEVELOPMENT, by Arthur W. Galston and Peter J. Davies. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 184. Illus. Cloth bound, $6.95; paper bound, $3.95. This up-to-date new book presents a critical assessment of the complex control mechanisms in plant development. It is addressed to advanced students in botany or plant physiology, students of animal development who are interested in morphogenesis in all organisms, and molecular biologists. The subject matter presented under sections includes—phytochrome and flowering; ethylene; auxin and tropisms; gibberellins; cytokinins; abscissic acid, dormancy and germination; reactions to injury; and senescence and abscission. The illustrations are first rate. This stimulating new text is very highly recommended.

ORGANIZATION AND CONTROL IN PROKARYOTIC AND EUCARYOTIC CELLS, edited by H. P. Charles and B. C. J. G. Knight. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1970. Pp. 457. Illus. $16.00. This stimulating volume contains the research papers by outstanding authorities presented at the 20th Symposium of the Society for General Microbiology held at Imperial College London in 1970. The specific objective of this symposium is to attempt an answer to the question of the significance of the differences between pro- and eu-karyotic cells so as to place this problem in connection with these organisms in perspective and chart the future course. Seventeen research papers beginning with the stimulating introductory article by R. Y. Stanier, and including the article by H. J. Vogel, J. S. Thompson and G. D. Shockman, on the DAP and AAA lycine synthesis paths, are only examples of the important researches which are reported by these and other authorities in this volume. The reader will want to obtain this volume at the first opportunity so that he may read for himself. This stimulating volume cannot be too highly praised, and is very highly recommended.

SUPPLEMENT TO R. H. S. DICTIONARY OF GARDENING, 2nd Edition, edited by P. M. Synge et al. Oxford University Press, 200 Madison Av., New York, N. Y. 10016. 1969. Pp. 556. Illus. $15.50. The 1st edition of the R. H. S. Dictionary of Gardening appeared in 1951, and the 2nd edition in 1956 in 4 volumes. Also in 1956, a Supplement was published in two parts. The first containing lists of recommended varieties of the principal kinds of cultivated plants; and the second, including such new revisions of genera, new species improved technical methods of disease and pest control, and corrections shown to be desirable, since the publication of the main volumes.

The 2nd Edition of the Supplement (1969) has now appeared to supersede the previous 1956 Supplement, and incorporates all material still valid in it. The number of pages has increased from 334 to 556 pages. Part I, includes lists of selected cultivars (varieties) of flowers, fruits and vegetables contributed by a large number of experts. Part II, additions and corrections to the four main volumes, pp. 154—556, contains one notable feature in that the **Gramineae** have been revised by the late D. C. E. Hubbard.

Users of the four main volumes of the Dictionary will find this new Supplement necessary as a working reference to bring the work up-to-date. This important new volume is very highly recommended to gardeners the World over.

THE PLANT KINGDOM, 3rd Edition, by Harold C. Bold. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 190. Illus. Cloth bound, $6.95; paper bound $3.50.

This third edition of a standard text is notable for the expansion of information about illustrative genera; the greater attention accorded to relationships between plants and human affairs; the greater emphasis on certain biological concepts; the inclusion of results of recent research, and an increase and improvement of the illustrations. The subject matter is developed under sections on unity and diversity of plants; algae; bacteria; slime molds and fungi; non-vascular plants; organization of vascular plants; gymnosperms; and angiosperms. This attractive and informative text is very highly recommended.

PLANT CELL PHYSIOLOGY, by Park S. Nobel. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1970. Pp. 267. Illus. $7.75. This concise, and attractive text was written for advanced undergraduate and beginning graduate students. It represents the first physiochemical treatment of the cellular and sub-cellular aspects of important topics in plant physiology. The sections of the book are concerned with cells, water relations in cells, cell solutes, light, photosynthesis, bioenergetics. Four appendices, answers to problems, and an index complete the volume. This excellent text with a new outlook is highly recommended.

TREE PATHOLOGY: A SHORT INTRODUCTION, by William H. Smith. Academic Press, 111 5th Av., New York, N. Y. 10003. 1970. Pp. 309. Illus. $100.00. This attractive new book is concerned with all agents capable of causing pathological conditions in forest trees. The author describes the agents and mechanisms by which such damage is caused. The first part is concerned with abiotic stress agents such as moisture and temperature extremes, and such stress agents as wind, snow, ice, lightning, mineral deficiencies and excesses, air pollution, and various other stresses. The second part is devoted to biological stress agents, such as nematodes, viruses, bacteria, fungi, etc. Part three is concerned with climate and tree diseases, and the fourth part is devoted to disease control. This stimulating text with a new outlook, is highly recommended.

NUMERICAL TAXONOMY, edited by A. J. Cole. Academic Press, 111 5th Av., New York, N. Y. 10003. 1969. Pp. 324. $9.00. The present volume contains eighteen papers given at an international colloquium at St. Andrews University by outstanding authorities in this field. The papers are concerned with the theory and application of the methods of numerical taxonomy. That this subject has come of age is evidenced by the fact that the early controversy about this subject has subsided, and the wild claims for the method are gone; and that many studies in widely varying groups of organisms are now based on numerical methods. Most important however is the fact that mathematicians are beginning to consider the subject seriously so that considerable improvement and validation of methods may be expected in the future. Highly recommended to all taxonomists, biologists, botanists and zoologists.

POPULATIONS, SPECIES, AND EVOLUTION, by Ernst Mayr. Harvard University Press, 145 N. Harvard St., Boston, Mass. 02134. 1970. Pp. 453. Illus. $10.00. This concise abridgement of Dr. Mayr's larger standard text, "Animal Species and Evolution" (1963) will be welcomed by the college student and the general reader. Again three dominant themes are emphasized—the species as the most important unit in evolution; the individuals and not genes as the target in natural selection, and the most important genetic phenomena in species as species-specific regulatory systems which give species internal cohesion. The text is adequately illustrated. A glossary, bibliography and an index complete the volume. Most highly recommended to all biologists.

THE BIOCHEMISTRY OF ALKALOIDS, by Trevor Robinson. Springer-Verlag. 175 5th Av., New York, N. Y. 10010. 1968. Pp. 149. Illus. $9.75. This concisely written text on alkaloids will be welcomed by all who are interested in these compounds. After a general introduction, and the consideration of general theories of alkaloid biosynthesis, the author summarizes the information on simple amino acid derivatives and protoalkaloids; the various alkaloids; the metabolism of alkaloids by bacteria and animals; and the biochemical pharmocology of alkaloids. Very highly recommended to all who are interested in alkaloids, including biosystematists.

LIFE AS REVEALED BY THE MICROSCOPE, by J. LeRoy Conel. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 93 + 204 figures and 5 tables. $7.95.

Subtitled, "An Interpretation of Evolution", this profusely illustrated book by an eminent authority, is concerned with the evolution of living things, particularly animal life. Sections are devoted to biogenesis; phylogeny of the nervous system; microscopical structures of the cerebral cortex, and deductions—biology and religion. This stimulating book is highly recommended to those interested in biology. The illustrations alone are worth more than the price of the book.

A MANUAL OF PLANT NAMES, by C. Chicheley Plowden. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 260. Illus. $10.00. This excellent manual on the subject of plant names has much to recommend it. The brief introduction to the history and rules for naming plants is followed by alphabetical dictionaries of generic names, specific epithets, common names, and botanical terms. The flower and inflorescence, the leaf, and the grouping of cryptogams and phanerogams or spermophyta—extended to some representative genera—are examined in some detail. An index to botanical and common family names completes the volume. Highly recommended to all gardeners.

THE PHYSIOLOGY OF FLOWERING PLANTS: THEIR GROWTH AND DEVELOPMENT, by H. E. Street and Helgi Oepik, American Elsivier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1970. Pp. 263. Illus. Paper covers, $5.95. This modern, up-to-date introduction to the flowering plants fills a definite need. After a brief introduction, the subject matter is adequately treated under germination, energy economy, water relations, mineral nutrition, transport of metabolites, resistence to desiccation and frost, growth—progress and pattern, cell growth and differentiation, growth movements, morphogenesis and development. Highly recommended to students of biology, and to those concerned with the teaching of biology.

THE BIOLOGY OF LICHENS, by Mason E. Hale, Jr. American Elsivier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1970. Those interested in biology have undoubtedly wanted a book that details in concise, easily readable English the biology of the lichens. The present book satisfies that need. The sections detail the morphology of the thallus and reproductive structures; reproduction and dispersal; physiology and nutrition; symbiosis and synthesis; growth and longevity; ecology and succession; chemistry; classification and taxonomy; economic uses and applications. This excellent book should be in the hands of all interested in biology. Highly recommended.

PLANT LIFE LIBRARY—continued on page 4.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

1. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

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Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, La. 70119

Mr. Charles Hardman, Associate Registrar, Box 936, Temple City, Calif. 91780

Correspondence about the registration of plant names should be sent directly to Mr. Mahan, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

(d) AMARYLLID SECTIONS

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2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

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3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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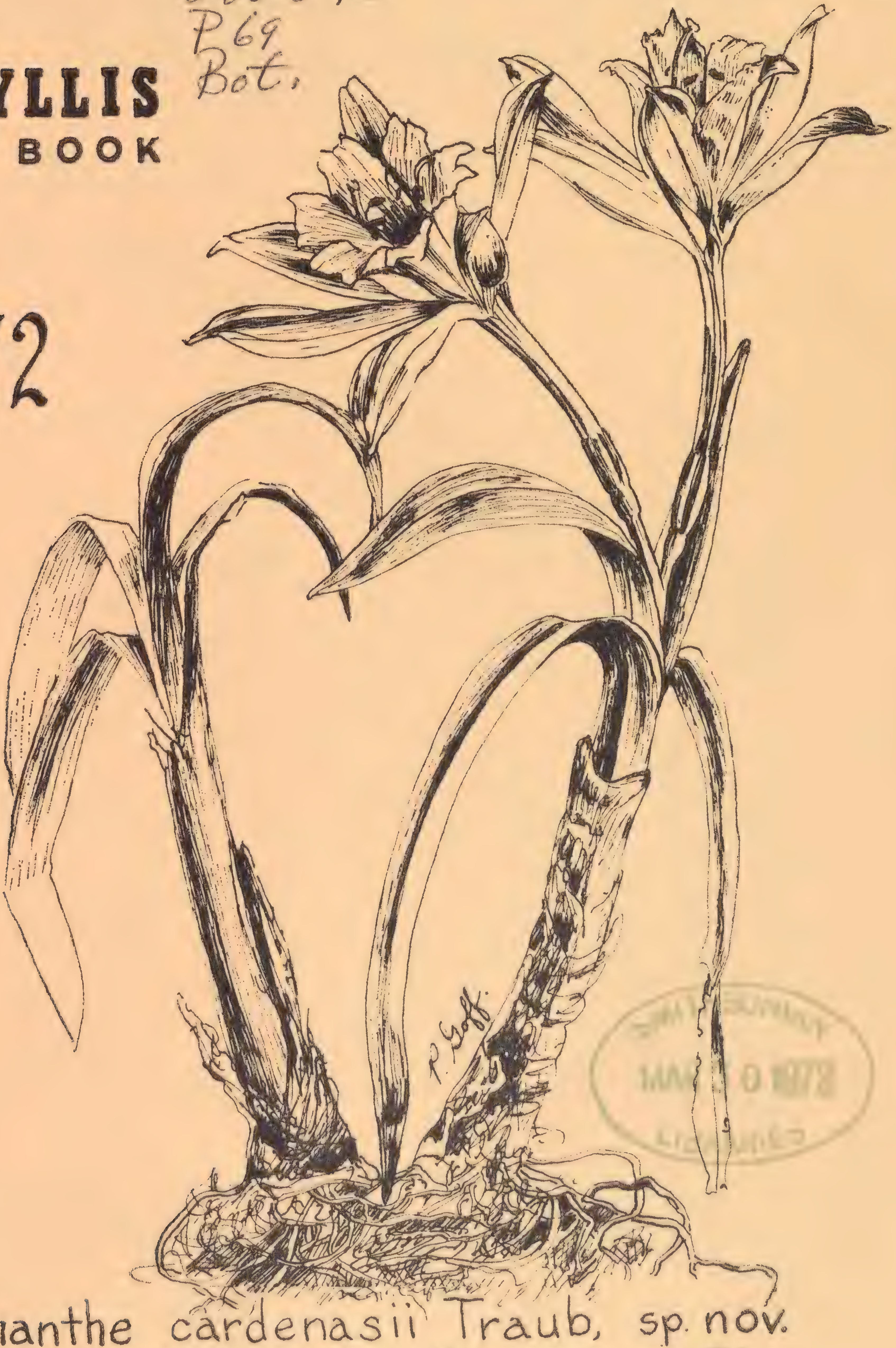

MAR 30 1972

Pamianthe cardenasii Traub, sp. nov.
An epiphyte collected at Km. 105, near Rio
Kellu Mayu, Province of Chapare, Bolivia,
in 1970

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1972

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CORRIGENDA—PLANT LIFE Vol. 27, 1971

Page 97, under "Literature Cited", 4th line, change "88." to "44—46."

Page 133, under "*Nothoscordum* Kunth, Nom. Cons., etc." the 5th line, paragraph beginning with "*Nothoscordum bonariense,* etc." and ending with "Goett. Abhandl. 24: 319. 1879." it to be inserted between the first and second lines from the bottom, under "*Nothoscordum* bonariense (Pers.) Beauverd."

Page 134, under "*Tristagma* Poepp. etc., 3rd line, paragraph beginning with "*Tristagma ameghionii,* etc." and ending with "Agronom. La Plata 7: 575. 1897", is to be inserted between the 10 and 11th lines from the bottom under "*Tristagma ameghinoii* (Speg.) Spegazzini."

Page 140, under "Flora Neotropica", 11th line, change "ananomic" to "anatomic".

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PHOTOSYNTHESIS, PART A, edited by Anthony San Pietro, In Colowick & Kaplan, Methods in Enzymology, Vol. XXIII Photosynthesis. Academic Press, 111 5th Av., New York, N. Y. 10008. 1971. Pp. xix + 743. Illus. $29.50. The present volume, and in a succeeding volume of Methods in Enzymology, the subject of photosynthesis is considered from the standpoint of a concerted enzymological attack on the mechanisms of photosynthesis. The present volume XXIII includes contributions from a large number of outstanding authorities on the isolation and culture techniques of algae, bacteria and diatoms; plant tissue culture; the preparation and properties of mutants; cellular and subcellular preparations from algae, bacteria and plants; and the purification and properties of components of the photosynthetic systems. Very highly recommended.

HOW TO ENJOY YOUR WEEDS, by Audrey Wynne Hatfield. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 192. Illus. $3.95. According to the author uprooted weeds are an important element in the improvement of soil fertility when composted, and are also suitable for other uses. A weed herbal includes chickweed, chicory, clovers, dandelion, daylily and many others. An identifying guide and index complete the volume.

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PLANT LIFE, VOL. 28, NO. 1, January, 1972

AMARYLLIS
YEAR BOOK
1972

Year Book of
The American Amaryllis Society
39th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
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PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the fine cover design based on the new epithytic species *Pamianthe cardenasii* which was discovered in 1970 in Bolivia. This species is described in the present issue and is named in honor of Dr. Martin Cardenas, the Dean of South American plant scientists.

This 39th edition of AMARYLLIS YEAR BOOK is dedicated to Mr. John Leonard Doran, Chairman of the Amaryllis Committee, who received the 1972 WILLIAM HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. His exploration trips for *Amaryllis* species and other amaryllids in South America have added many new species to the plant collections in the United States and other lands.

Mr. Doran contributes an interesting autobiography; a short biography of his mother who accompanied him on some of his exploration trips, a report on his 1969-1970 explorations, an article on some cultural requirements of *Amaryllis* species, and details for obtaining good black-and-white reproductions from color slides.

Articles on Amaryllis in the present edition include a number of important contributions. Dr. Cardenas describes some new Bolivian *Amaryllis* species; Dr. Cage writes about Amaryllis breeding with special reference to inbreeding; Dr. Mertzweiller contributes an article on Amaryllis breeding; Dr. Bell gives directions for culturing immature Amaryllis embryos; and Mr. Beckham writes about amaryllis culture.

Dr. Schulze contributes a most interesting article on a new aquatic *Crinum* species from Thailand. *Crinum thaianum* Schulze is apparently a fine aquarium plant.

Dr. Sterling and Miss Huang present a most important contribution concerning the presence of laticifers in *Allium, Caloscordum, Nothoscordum, Tristagma* and *Tulbaghia.* The wide spread presence of laticifers in the *Allieae* to which these genera belong make it necessary to reconsider the status of the *Alliaceae,* and warrant that it be raised to ordinal level as indicated toward the end of the present volume.

Prof. Ravenna proposes a new genus, *Famatina,* and contributes an article on Latin American amaryllids. Dr. Cage writes about the chromosomes and growth habit of *Sprekanthus cagei;* Mr. Caldwell contributes a most important article on *Lycoris* and describes a possible new *Lycoris* species. Mrs. Wilson writes about the cultural requirements of Rain Lilies in Galveston, Texas. Mr. Hardman contributes an article on *Leucocoryne odorata* and his annual *Nerine* report.

Mr. Tisch writes about his experiences with amaryllids. Mr. Buck presents his annual Daylily report. Mr. Bauml summarizes the Dr. Howard 1971 Mexican explorations trips.

There are reports on the 1971 Amaryllis shows, and other important contributions as shown in the table of contents.

Contributors to the 1973 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1972, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.* See PLANT LIFE 28: 110. 1972 (color slide prints).

December 15, 1971 *Hamilton P. Traub*
2678 Prestwick Court, *Harold N. Moldenke*
La Jolla, California 92037

PLANT LIFE LIBRARY—continued from page vi.

A FERN IS BORN, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 96. Illus. $3.50. This is No. 1. in the Sterling Nature Series. This little book is designed to introduce youngsters and their parents to the fascinating study of the life processes as revealed in the life history of the ferns. The text is profusely illustrated with excellent close-up illustrations which alone are worth more than the price of the book. Very highly recommended to parents and others who are looking for appropriate gifts for the youngsters.

THE HIDDEN LIFE OF FLOWERS, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 96. Illus. $3.50. This companion book to the preceding one, and again profusely illustrated with close-up photographic reproductions, showing how plants are born, is designed for youngsters and their parents. The ordinary corn poppy as well as other examples are explored, and the action of the wind and insects in pollination are detailed. Very highly recommended to parents and others who are looking for appropriate gifts for the youngsters.

A CLASSIFICATION OF THE EUCALYPTS, by L. D. Pryor and L. A. S. Johnson. The Australian National University, Canberra. 1971. International Scholarly Book Services, P. O. Box 4347, Portland, Oregon 97208. Pp. 1x+102. $3.95. "Abstract: A new classification is presented of all taxa of **Eucalyptus** (and **Angophora**) (Myrtaceae—Leptospermoideae), on the basis of studies from many disciplines and extensive field experience. This is not in the traditional revisionary form and formal nomenclatural innovations at the species and subspecies level will follow later. Infrageneric classification into subgenera, sections, series and subseries follow a rationalized plan explicitly divorced from the traditional system embodied in the International Code of Nomenclature. This is accompanied by an equivalent and flexible system using 1- to 6- letter coded designations for taxa of the various ranks, which embodies the whole classificatory structure. There is a comprehensive index to specific and infraspecific names. Discussion covers the kinds of evidence used, the inflorescence, the operculum, the ovule, and the seed, as well as genetic behavior, the range of variation-patterns found, and the case for recognition of segregate genera. Recognition of two (only) such genera (**Eucalyptus** s. str. and **Symphyomyrtus**) as proposed by some recent authors is considered oversimplified and contrary to the evidence. Although division into a number of genera may perhaps be desirable in the future, it seems best at present to consider all the eucalypts as constituting a single genus with eight subgenera. **Angophora** would logically be included as one of these but, to avoid possible future reversals, its generic status is not formally reduced at this stage."

PLANT LIFE LIBRARY—continued on page 32.

Dedicated to
John Leonard Doran

HERBERT MEDALIST—JOHN LEONARD DORAN

JOHN LEONARD DORAN

AN AUTOBIOGRAPHY

My mother and father were interested in all the marvels of nature and during my childhood I was exposed to these interests. My mother grew many kinds of plants and had a special interest in *Amaryllis*. My interest in *Amaryllis* was aroused early in life but did not reach the "disease point" until about 1960.

My parents sold the Utah farm and moved to California a few days before I was born on December 8, 1914 in San Bernardino, California. My father Junius H. Doran was a civil engineer engaged in the construction of railroads, highways, pipe-lines, etc. My mother Corabelle Whiting Doran was a nurse before her marriage. I grew up in the San Bernardino area.

Although my interest in plants was never submerged for long, I did "stray away" at times. In the late 1920's I built and operated W6BNL, an amateur radio station. I worked on a game bird farm where we raised quail, chuckar, and pheasants. I worked as an analytical chemist for Griffin Laboratories about a year then went to Kincannon Mines as a chemist for a few months. The next job was William Barnhill Laboratories, whose business was soil problems of citrus groves in San Diego, Riverside, and San Bernardino counties. A year later I joined the McKinney Optical Co. who designed and manufactured a diverse line of precision instruments. Here my interests were diverted to applying instrumentation of all types to industrial uses. In 1939 I joined one of the airplane manufacturers in the research laboratory where I was associated in developing the first concepts of the fatigue of material that could be applied to design; a new method, still used, of measuring forces developed by high speed wind tunnel models; microminiature probes for automatic recording of effects of abnormal environments on animals and humans. After the age of missiles began, I became engaged in development of such things as ultra high speed cameras, underwater firing mechanisms for missles, squib whistles to induce talking amongst porpoises, high temperature lubricants, and many classified programs. Concurrently we were working on the effects of smog and toxic materials on animals and plants. Because of the need for large quantities of tissue with the same genetic properties in some of the cancer research programs, we developed nutrient solutions and mechanisms suitable for producing great quantities of tissue from a small piece of plant. I became interested in embryo culture of seeds and did development work with medias to complete the growth of incomplete embryos and with auxins and other growth substances to increase the rate of growth and give better development. An important phase of this process is the study of endosperm and

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embryo contained growth inhibitors and their destruction or removal. In the development of medias, I introduced the Tyndallization process which minimizes the decomposition of organic materials with resulting toxic by-products. A tissue culture process was devised that enabled a small sprig of an outstanding Japanese *Chrysanthemum* given me in December 1956 to be grown to more than 2000 cuttings ready for 1957 spring planting. In 1963, I was able to visit some of the outstanding horticulture establishments in Europe. Carters had an ''eye opening'' exhibit in the Chelsea show. Michael Hoog of Van Tubergen conducted me through Holland and showed me the methods used by the Dutch to grow and propagate many plants. While in Germany I was guided by Dr. Werkmeister, the geneticist in West Germany's famous University of Geisenheim. I spent several days in the laboratory of K. Stormly Hansen at Hvidovre, Denmark under the tutelage of Dr. Aagard and Mrs. Christensen. The Hansens have led the world in their work of high heat culture and subsequent meristem culture of carnations and by this process nearly freeing the plant of virus diseases. In 1964 I made the first collection trip for amaryllids in the wild, these activities have been recorded in Plant Life (Doran, 1969, 1970, 1971).

I wish to thank all the people who have helped with collecting, with identification, and the AMERICAN PLANT LIFE SOCIETY for awarding me the WILLIAM HERBERT MEDAL for 1972.

BIBLIOGRAPHY

Doran, J. L. Notes by an Amateur Collector. Plant Life 25: 37-40. 1969.

——. Collecting South American Amaryllids, 1964-1968. Plant Life 26: 49-56. 1970.

——. Seeds of *Amaryllis reticulata* L'Hérit. Plant Life 27: 54. 1971.

EXPLORING FOR AMARYLLIDS IN SOUTH AMERICA, 1969—1970

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Amaryllis parodii (Hunziker & Cocucci, 1969) had not been used in breeding experiments with the yellowish *A. evansiae* and *A. aglaiae* hybrids and in 1969, we decided to try to recollect it. *A. parodii* grows in the desert areas of Northern Argentina and into southern Bolivia. The apparent range is very narrow but about 900 miles long. Groups of the plants occur at scattered intervals in the general neighborhood of 2000 ft. altitude. My mother accompanied me on the two 1969-1970 exploration trips.

I. DECEMBER 1969—JANUARY 1970 EXPLORATIONS

We were to leave December 15, 1969 at one A.M. Monday morning but the air line called and wanted us to be in the airport early. We left home at 10 P.M. Sunday. Our flight was to stop at Mexico City, Bogatà, Lima and arrive about midnight, Monday night, in Buenos Aires. We landed at Acapulco where the temperature was 95° and waited three hours for the fog to lift in Mexico City. Because of the additional landing at Acapulco, they did not have fuel enough to go to Bogatà and had to make a ''technical stop'' for fuel at Panama City. I was unable to get an answer as to why the fuel was not obtained in Mexico City. We arrived in Buenos Aires eight hours late, and instead of getting some needed sleep in Buenos Aires, we had time only to exchange some mony and go from the international airport to the airport used for internal flights. We arrived at Cordoba in the late afternoon on Tuesday where the temperature was 105°F. and very windy. The hotels were full, but I got an air-conditioned room except the air-conditioner didn't work. A repair man came and changed the unit but the new one didn't cool and was very noisy but did stir the air a little. The restaurants in Argentina open at 9 P.M. After eating, I went to bed in a beastly hot room. By now, we had been over 60 hours without sleep. The next day, Wednesday, was spent talking to Dr. Hunziker and Dr. Cocucci and getting maps, information, and tickets. Our visit with Dr. Hunziker and Dr. Cocucci gave us a wealth of information on the location and taxonomy of many of the *Amaryllidaceae* of Argentina. Left Cordoba at 9 P.M. on a bus. It was raining hard, the temperature above 90°. About 50 miles from Cordoba, we got out of the rain, then it was hotter. Arrived in Ojo de Agua a little after 1 A.M. Everyone in the little town including even the smallest children were outside sitting still—was too hot to go to bed. Got a room in a motel—the only accommodation in town, and the only room. Stood around for about two hours because it was too hot to go to bed.

Thursday, got up about 6 A.M. and was going to take a shower but there was no water. Went looking for a car, some help and breakfast—all unobtainable. Finally, got an egg, a couple pieces of stale bread and a cup of something they served as coffee in a place I am hesitant to describe and was sure hesitant to eat in. Finally found a car, a shovel, and left town about 10 A.M. Dr. Hunziker had told me that *A. parodii* no longer existed in Serrania de San Miguel because the area was so over grazed. The goats had eaten all of them. We went south of Ojo de Agua and found *A. parodii* in full bloom. Km. 915 to 925. Found another group 10 Km. east of Ojo de Agua on the El Simbol, Baez, Sol de Julio road. Again between Km. 934 and 937.

Plants are usually not close together but rather scattered. Although some grow in a bush or near another plant, most grow in the open. They were not seen in areas of high brush but always in areas of low growth. Soil was granitic and very rocky. They were difficult to dig.

Getting the rock out often damaged the bulb. Biggest bulbs found were 3½ inches in diameter. Smallest bloom size bulb was 2½ inches in diameter. Soil was barely moist, dark grey, sandy, low in organic content. Top of the necks were from flush with the surface to one inch below surface. No insect damage was seen except in one area, a small curculio ate all the seeds in the pods. Root systems were huge. Leaves were fully developed before flowering.

Went back to town where I cleaned, washed and packed the bulbs, then caught a bus a 5 P.M. Arrived in Santiago del Estero about 10 P.M. My mother was exhausted so we ''loafed'' Friday morning. We were going to look the town over that afternoon, but about noon, it started to rain and the wind blew a gale. It blew people off their feet, blew a door out of the hotel, blew two light fixtures out of the bus station.

We caught a bus that evening for Tucuman. In five days, we had traveled from Los Angeles to Buenos Aires, then 750 miles north collecting pollen, seed and bulbs of *A. parodii* in three locations spread over an area 350 miles long.

The next three days were spent visiting friends, going over the herbarium at Instituto Lillo, and having discussions with Sr. Alejo Moris, Dr. Golback, Dr. Vervoorst and others. Dr. Vervoorst told me of a possible new species occuring in Cumbres de Taficillo. I spent the next day (Tuesday), getting a trip arranged to go after these plants. Horses were obtained. Wednesday morning, Sr. Lucio Chocobar, a *composino* familiar with the area, and I left Cuidad Universitario climbing quickly from 3000 feet elevation to over 5000 feet, crossing a shallow canyon up over another mountain and down into Quebrado de Cainfo where we found some *Amaryllis* under *Podocarpus*, but the ones we had been told about were supposed to be located in the *Podocarpus* forest growing on the east side of the 10,000 foot high peak ahead of us. We spent several hours searching the *Podocarpus* forest without finding a single plant. We returned to Quebrado de Cainfo. The plant was growing on the slopes near the bottom of the canyon in very wet, black clay soil under *Podocarpus* at an elevation near 6500 feet. Some were found within a few inches of pools of water fed by springs. Seed pods were numerous but no flowers were found. Blooming size bulbs were from 2.5 to 3 cm. in diameter, 3 cm. high with a 1.5 cm. neck. The root plates were 1 cm. thick by 1 cm. in diameter. Plants were usually 2 flowered but an occasional 3 flowered one was found. Leaves were 46 cm. long by 3 cm. wide. In viewing a couple hundred plants, most had 3 leaves, a few with 2 and one with four was found. Scapes were 9 x12 mm. at top of bulb and 50 to 65 cm. high above the ground. Bulbs had only a few roots (21 to 35), 2.5 to 3.5 mm. in diameter. Bulbs averaged 11 cm. from top of neck to surface of soil. The area had many ferns and mosses. There was considerable moss on the trees and *Tillandsia recurvata* was very common. Seeds of the *Amaryllis* species were gathered and distributed as D-117.

Arrived in Tucumán late Christmas Eve—most restaurants were closed. The ones that were open were reserved for parties where they drank champagne and exchanged presents. On the street, skyrockets and firecrackers were fired. Christmas day was very quiet. The weather was hot, no decorations were seen on the streets, it did not seem like Christmas. We did hear an occasional Christmas carol on the radio in the morning.

Fig 2. Argentina: **left,** wall of Quebrada de Toro canyon, about 4,000 ft. deep, altitude 6500—7000 ft; **Amaryllis argentina** is native to the slopes of this canyon, above El Elisal, Prov. of Salta. **Right,** on the north wall of canyon Quebrada de Toro, elev. 7000, collecting **Amaryllis argentina,** flower barely visible in center. Photos by J. L. Doran.

We left Tucumán for Salta on Friday, December 26 by bus. On the way, the engine quit and not far from where we stopped *Amaryllis* were observed at Km. 1387 and altitude 3300 feet. We saw *A. parodii* south of General Guermes. (See Fig. 2.) On the way into Salta, we saw *A. argentina* (Pax) between Km. 14 and 18, altitude 4400 feet (see Hunziker, 1967). We returned here the next day and found three types of flowers. One had a deep maroon tube for 7½ cm. from ovary with plain petals and a yellow throat. Another was maroon for 5 cm. from ovary with slightly ruffled petals and green throat. The third type had a green tube, green throat and quite ruffled petals. All flowers were essentially the same size and shape, the tube was about 10 cm. long.

Harry Blossfeld told me he collected *A. argentina* (Pax) in Quebrada de Toro at El Alisal. Quebrada de Toro is a deep narrow canyon appearing to be 4000 to 5000 feet deep at El Alisal alt. 6500 ft. (*Amaryllis argentina* D-118, Quebrada de Toro). See Fig. 2. The canyon is so steep here that the railroad to Chile stops, they throw a switch at the back of the train and back up-hill, stop, throw a switch in front of the train and go forward up-hill, stop and repeat again, to gain altitude fast enough to continue up the canyon. I tried to find Blossfeld's guide, Sr. Pacifico Serapio. I was told he was a very old man and now lived in Salta but his niece lived by the railroad station. She told us that the plant grew on the north wall of the canyon but was at least two weeks too early for flowers. We went up the canyon several miles and couldn't find anything, turned around and came back, stopped to examine bromeliads on the cliff and there was the *Amaryllis* on the cliff. The leaves were only a few inches long. The bulbs were growing in cracks in the rock along with cactus and tillandsia. We tried digging a bulb, one of us held the other to the cliff while he dug. About every half hour, you could break away enough rock to extract a bulb. Each bulb was by itself in a crack about 1 to 1½ inches wide and filled with a silty soil full of organic material. (*Amaryllis argentina* D-119, 14 km. east of Salta.) Every place you tried to hold on to the cliff, there was a cactus growing. One place I could reach five genera of cactus: *Opuntia, Cleistocactus, Rebutia, Trichocereus* and *Parodia*. The *Rebutia* was in bloom.

The next day, Sunday, we left early to try to collect at Tumbaya. When we arrived at Jujuy, it was pouring rain. When we reached Yala, they told us the bridge was out at Rio Leon. Returning, we found at Km. 1443 (about 8 Km. north of General Guermes) a Zephyranthes (?) D-120, white; perigone 5 cm. long, a rosy blush on outside center section of petal 2½ cm. long, rosy keel 1/3 of the way from ovary; filaments, 1/3 length of petal; stigma trifid, style 2/3 length of petal; scape single flowered; pedicel 3 cm. at anthesis, elongating to 3.5 to 5.5 cm. in seed. Undeveloped leaves 1 cm. wide. Bulbs were 2½ cm. in diameter by 3.5 cm. high with a 2 cm. neck. This area has many *Synandrospadix vermitoxicus (Araceae),* the common name in Argentina is Puki. The nice green leaves grow from a 5 inch diameter rhizome with all the roots coming out of top of rhizome to be near the surface in order to better utilize the scant rainfall in the area. These were in bloom with 8 inch deep purple flowers.

I had been sick for several days but by the time we got back to Salta, I just couldn't go any further. I went to the Hospital San Bernardo where the doctor thought I was getting pneumonia. Massive doses of antibiotics for two days got me to where I could go on. Checking with the airline office, I was told the weekly flight to Bolivia was canceled for the next two weeks and only way to get to Bolivia was to go to the border, walk across and find some mode of transportation for continuing in Bolivia. We left Salta at 6 A.M. on December

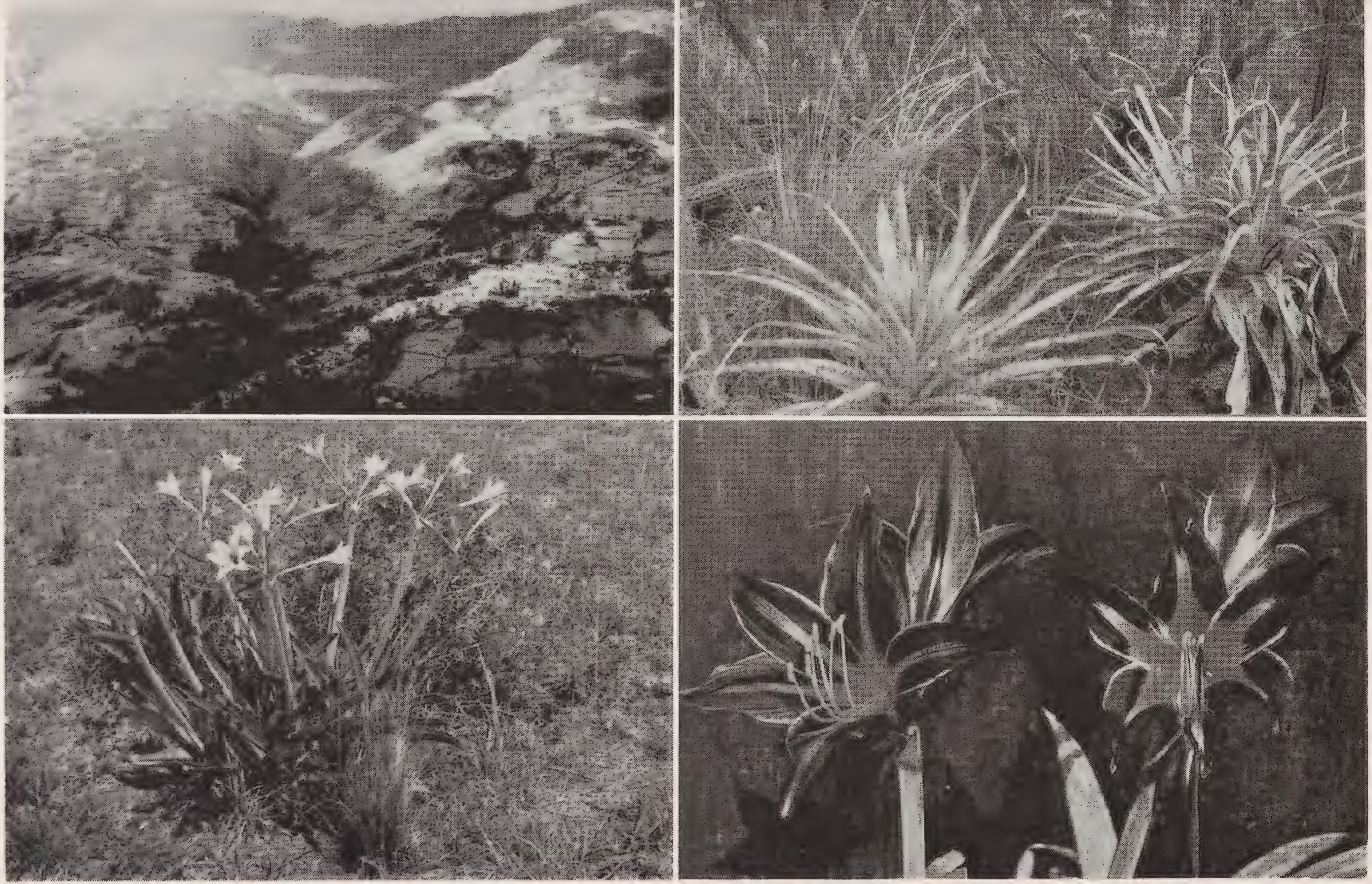

Fig. 3. Upper left, town of Sorata, in right foreground, elev. 9,000 ft. Location of **Amaryllis mandonii** is in canyon to left, about ¾-inch down from top center. **Upper, right, Amaryllis cybister** in bloom at Paracaya, Bolivia in front of cacti and between bromeliads. **Lower left, Amaryllis paradii** in native habitat south of Ojo de Agua. **Lower right,** two forms of **Amaryllis escobaruriae.** Photos by J. L. Doran.

31 and after a miserably hot, dusty ride, arrived in Pocitos about 3 P.M. The bus was met by a number of boys pushing wheelbarrows each of which had a license plate. We secured the services of a wheelbarrow for our luggage and went about a half kilometer to Argentine customs and immigration where we went through the usual formalities, loaded our luggage on the wheelbarrow, went through a gate in the barb wire fence, crossed a dry river bottom and we were in Bolivia. We obtained a car to take us to Yacuiba 3 or 4 kilometers away. This town had no paved streets, no sewer system, no piped water, no restaurants, no hotels and very few cars. A commercial airline came in once a week—I had a 6 day wait. There was a Bolivian army transport due that afternoon that would go to La Paz the next day but they did not know if space was available. I waited two hours until the plane came and was able to get tickets to Cochabamba, a 800 kilometer trip, for 145,000 bolivianos ($12) each. We left Yacuiba without even a cup of coffee at 7 A.M. New Year's Day, 1970. The plane was a paratrooper's DC-3 with metal benches along the sides to sit on. We made six stops between Yacuiba and Cochabamba. At each stop, some freight was left and more was added, some people got off and new ones got on. Each batch of passengers were air-sick and vomited on the floor. The plane was piled to the ceiling with freight and only enough room to stick your foot in a hole amongst the freight when you sat down. We arrived in Cochabamba at 6 P.M.

I went to see Dr. Martín Cárdenas and found he was very ill. My mother became ill and nothing seemed to help. I decided it was best to return home—eight days later we arrived home.

II. SEPTEMBER—OCTOBER 1970 EXPLORATIONS

My intention had been to collect a quantity of *A. aglaiae* for distribution in the United States but had been unable to do this. A notion persisted that the Matto Grosso should be considered for the possible existence of new species. Correspondence with Hugh Bush of Kansas City, Missouri. indicated a possibility he might go to South America. Ultimately, the trip became a reality. Bush was to meet me at Cuibá on October 2. My mother and I left Los Angeles on September 25 and arrived in Cochabamba on the 26th. Took the weekly plane for Corumbá on the 29th. Travel through the Paconé and San Luiz de Caceres area revealed only *A. belladonna* in huge quantity, all in bloom, some in patches of a quarter acre. On another trip to Diamontino and west of Alta Paraguey, found only *A. belladonna.* From conversations with Peace Corps people and local botanists it would seem that only *A. belladonna* occurs in this area.

Bush and I had intended to get a canoe and go down the Itenez River to Principe de Beira, then up the Itonamas River to Magdalena or up the Machupo River to San Joaquin but the river was very low, they thought it would take three weeks. Bush did not come on the scheduled day. I waited two days and decided to go to Cochabamba on the only flight per week to Santa Cruz. When I got on the plane, the stewardess gave me a newspaper. The headlines were that President Ovanda says he has control. When I arriveed in Santa Cruz, several hundred camposinos were parading in the streets and everyone was afraid. The radio announced that Ovanda had resigned to prevent bloodshed. I got a ticket and reservation for Cochabamba for the next morning. In a couple of hours, the airline called and said the flight was canceled. I spent the next day collecting 50 kilometers south of town. When I returned, the radio said Miranda had been president for a few hours but the air force bombed the presidential palace and he had left. The following day, Torres took over. The airline said they would fly soon and to check with them every hour or two. Two days later I reached Cochamamba where my mother was staying. The U.S. Information Service representative had been taken as a hostage and the building burned. Sixty were killed and 300 wounded at Oruro.

I had a chance to get a flight out of the country to São Paulo. We went to Buenos Aires, then to Tucumán. Collected the *A. aglaiae* I wanted. I wanted to go into the Rio Cachuna area but the weekly airplane to Bolivia would be in Salta the next day. I decided I did not want to wait another week. We caught a bus for Salta which arrived at 4 P.M. I went immediately to the airline office. They had only one seat available but would call me at 7 o'clock and tell us if they had a cancellation. When I got to the hotel, they gave me a two day old telegram from Hugh Bush saying he would be on the plane from Santa Cruz. A coincidence like this is just a miracle. I thought he had not come to South America. With a few million square miles to be in, he accidentally ran into me. When he arrived, we checked the airline office, they did not have a seat for him but advised checking at 5 a.m. We went to the airline office at 5 a.m. He got a seat, we went to Cochabamba. Although the political situation was still unstable, Dr. Cárdenas thought we might get permission now to enter the Yungas de La Paz. We finally were granted permission to go into Sud Yungas for only three days but not Nor Yungas. Dr. Cárdenas took us on a conducted tour where we obtained some bulbs in five locations. Only one was in bloom, a new species *A. lapasensis*, found at Km. 70 on the Unduavi—Chulumani Road. *A. lapasensis* is similar to *A. pardina* in stature and conformation of flower but the bower is green with a near solid red interior. It grows on very steep rocky slopes in low vegetation.

Upon returning to La Paz, we made arrangements to leave at 6 a.m. the next morning for Sorata, but because of difficulty on obtaining gasoline, did not leave La Paz till 7:30. We stopped in a village for breakfast, a cup of coffee and two *panadita tierno* (biscuits). We arrived in Sorata about 10. Sorata has an altitude of 9000 feet. Progress up the side of the mountain was difficult because of bad footing and very steep terrain. In three hours, we were at 10,300 altitude and had found only a few *Urceolina.* Meneces wanted to swing to the South towards the river but I decided to go into a small canyon to the north. The slopes of the canyon proved to be covered with a small plant similar to *Puya.* I came out of the little canyon above 10,500 ft. heading west on the north wall of the main canyon. To skirt some vertical places, I crossed some patches of corn where the slope was so steep that by shuffling your feet, you slide down hill at a good pace. I went about a quarter mile along the bottom of these cliffs and found *A. mandonii* with bulbs almost "upside down" growing on the near vertical cliff. The bulb held itself and some soil to the

Fig. 4. Mrs. Corabelle Whiting Doran

rock by its roots. Apparently, they slide off but being held by the roots, they remain on the cliff but are nearly "upside down". *A. mandonii* has a long neck which curves upwardly holding the leaves in a near normal position. The largest bulbs were about two inches in diameter. Collecting these proved to be hazardous and slow but by holding on to bushes and testing each move I could get one here and there. I seldom found a place where I could put any weight with a foot. It was necessary to support one's self almost completely with ones hands. I arrived at the road of Sorata about 3:30. Meneces arrived a few minutes later. He had found bulbs near the river at 9400 ft. elevation. We went to Sorata for lunch at 4:30. We arrived at La Paz at 9 p.m. so covered with dust, Meneces' black hair was white. I went quickly to the hotel for a desired shower. The water ran but did not get warm. In fact, it seemed to get colder. When I finished, Hugh Bush was ready to step in, expecting warm water. I got a good laugh at the howls from the ice cold water.

Arrangements were made for Hugh to return to the U.S. I went back to Cochabamba to make a trip into the Chapre river area but my mother became ill and six days later, we were home.

BIBLIOGRAPHY

Hunziker, A. T. and Cocucci, A.E. Estudios sobre amaryllidaceae. Boletín de la Academia Nacional de Ciencios (Córdoba, Argentina) Vol. 41:5-16. December 1969.

Hunziker, A. T., Kurtziana 4:13. December 1967.

CORABELLE WHITING DORAN

A Brief Biography

Just turned 86 and is planting seeds of Nerine. The breeding of Nerines is one of her newer projects. She will plant all the seeds of the *Amaryllis* if I don't keep telling her there is no place for so many seedlings. She has always been interested in ornamental plants and has constantly encouraged me.

Born November 10, 1885 on a farm near San Bernardino. Her parents were Delevan Gerry, and Adelaide Janette Mossman Whiting from near Boston. Graduated from Pacific Hospital in Los Angeles as a nurse. Married Junius H. Doran, a civil engineer. Always lived in Southern California and has always gardened. Enjoys traveling and has accompanied me on some of my collecting trips.

The beautiful species, *Amaryllis doraniae* Traub (see description in PLANT LIFE 27: 43—44. 1971) was named in her honor (see also Fig. 5-A). The outstanding feature of this species is the clear rose color of the flowers. It is probably unique in this respect.—*J. L. Doran*

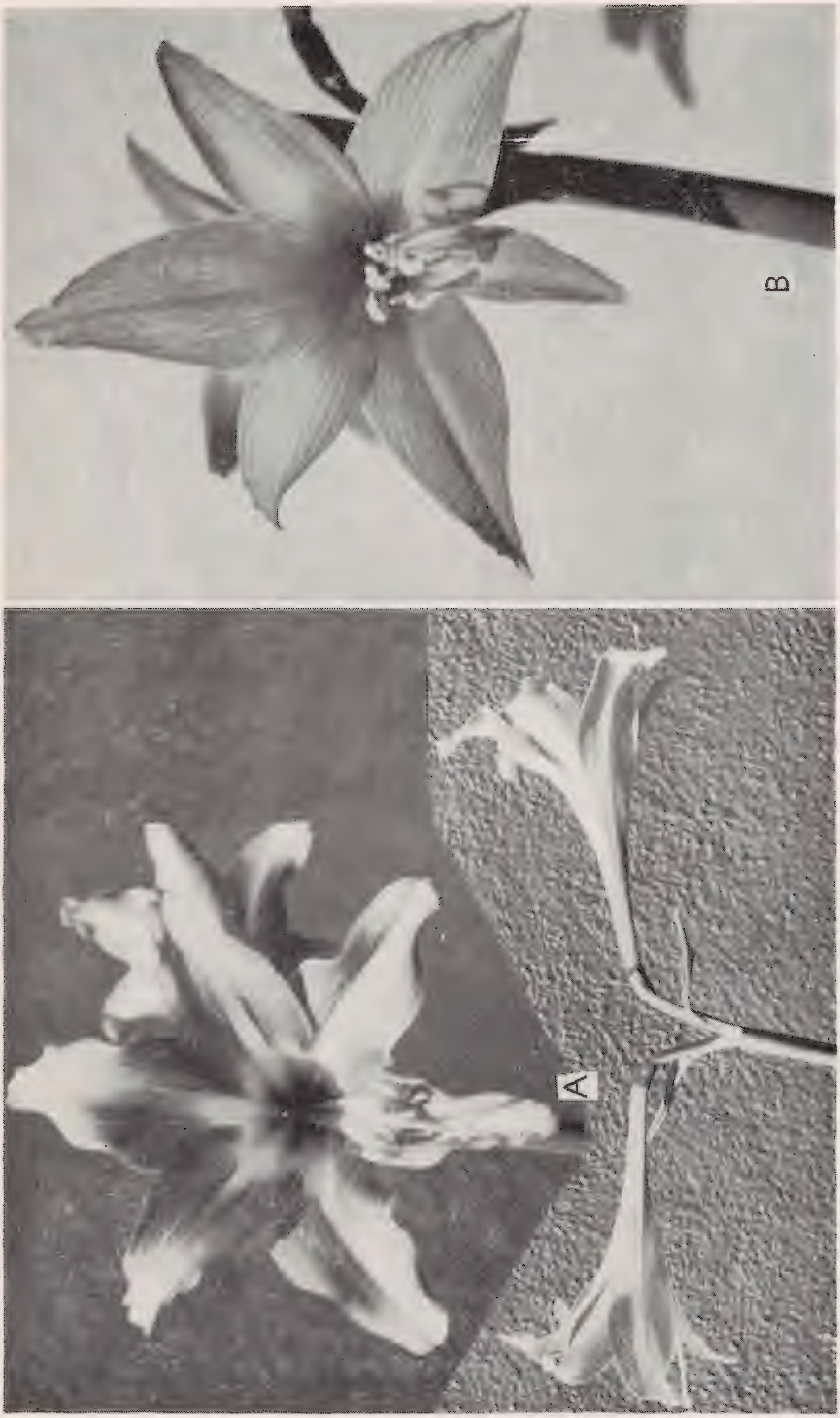

Fig. 5. **A, Amaryllis doraniae,** Traub, native to the estuary of the Rio Orinoco, Venezuela; **B, Amaryllis blossfeldiae** Traub & Doran, native to Brasil. See top of page 19.

AMARYLLIS BLOSSFELDIAE TRAUB & DORAN

Amaryllis blossfeldiae Traub & Doran was published in PLANT LIFE 27: 44—46. 1971. In Fig 5-B, the flower of this species is illustrated. This differs from that of *Amaryllis striata* Lamarck to which it is related.—*Hamilton P. Traub*

IN MEMORIAM—FRED J. BUCHMANN, 1913-1971

Those of us interested in horticulture and conservation lost a loyal friend and fellow worker when Dr. Fred J. Buchmann passed away on January 22, 1971. He was born July 3, 1913, in Cullman, Alabama, and had resided in Baton Rouge, Louisiana for nearly 30 years. He received the Bachelor's degree in Chemistry (B. S.) Alabama Polytechnic Institute, June 1935; the Master's degree in Organic Chemistry (M. S.) in June 1937 at the same college; and the Doctor of Philosophy degree (Ph.D.) also in organic chemistry, in 1941 at the University of Nebraska. He was employed by the Esso Research Laboratories (Humble Oil Company) as a research chemist. It was my privilege to have known him both as an outstandingly capable professional chemist and as an Amaryllis and Hemerocallis enthusiast.

Always a lover of nature and the outdoors, he had great respect for the ecology and was an ardent supporter of conservation. My first association with Fred in horticultural pursuits was about 1955 when we shared activities in collecting and later in hybridizing Louisiana native irises. This beautiful plant is now disappearing from its natural habitat. Fred expanded his interests to include the Amaryllis species about 1960; this resulted largely from his close friendship and association with the late Professor Claude Davis. Fred accumulated what is probably one of the most extensive personal collections of Amaryllis species in this country. He grew the species exceptionally well and he described his activities in several interesting articles in PLANT LIFE. In more recent years he became interested in tetraploid Hemerocallis and had already obtained quite a collection and began a hybridizing program.

Fred Buchmann was the founder of the Baton Rouge Amaryllis Society and the first president of this organization. He was serving on the Board of Directors of the Louisiana Society for Horticulture Research at the time of his death. He was also a member of The American Plant Life Society, the Mens Amaryllis Club of New Orleans, the Louisiana and American Hemerocallis Societies and the Louisiana Ornithological Society. Fred is survived by his wife, the former Cordelia Atkeson, and two sons, Fred J. Buchmann, III and Tom A. Buchmann.—*Joseph K. Mertzweiller*

1971 HERBERT MEDAL PRESENTATION TO DR. A. GOMEZ RUPPEL

Pedro F. Ravfnna

The William Hebert Medal for 1971 was awarded to Dr. Carlos A. Gomez Ruppel for his outstanding contributions toward the advancement of the amaryllids. The award ceremony took place on June 20, 1971 (Argentina's Flag Day) in the patio of the Hall of Agriculture, the National University of Mendoza, Argentina. The Medal was presented to Dr. Ruppel (Fig. 6) on behalf of the American Plant Life Society by Pedro Felix Ravenna before an audience of fellow professors, students of Dr. Ruppel, and many guests.

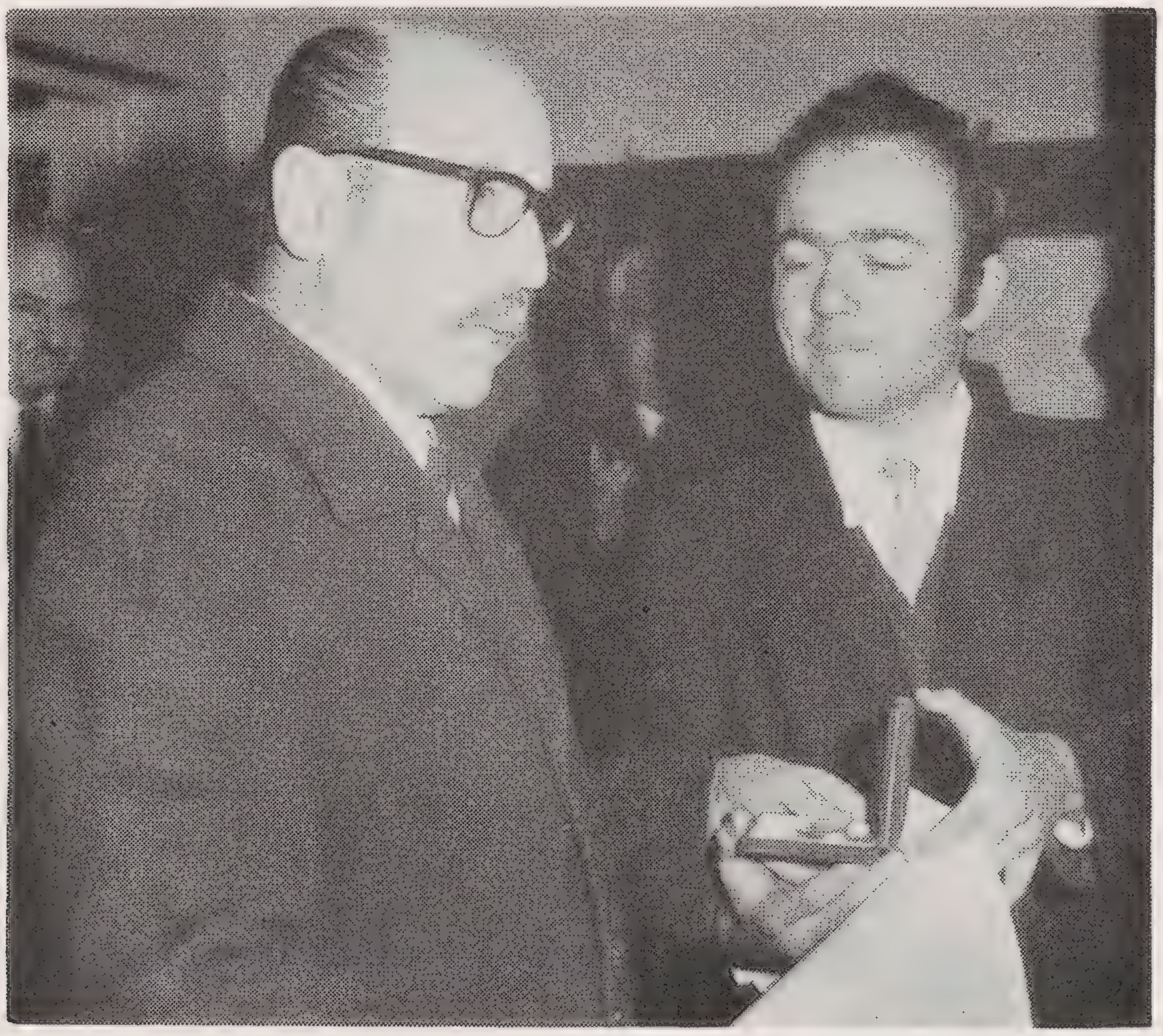

Fig. 6. Sr. Pedro F. Ravenna (right) is shown presenting the 1971 Herbert Medal to Dr. Carlos A. Gomez Ruppel in award ceremonies held in the patio of the Hall of Agriculture, the National University of Mendoza, Argentina, before an audience of fellow professors, students of Dr. Ruppel, and many guests, on June 20, 1971.

The reader is referred to the 1971 issue of PLANT LIFE for the autobiography of Dr. Ruppel.

EDITOR'S MAIL BAG

We are sad to have to announce the death of Mr. Elmore W. Menninger, July 2, 1971, 1030 North Old Ranch Road, Arcadia, Calif. 91006. Mr. Menninger was injured in an automobile accident and never recovered. His many friends will miss him very much.

Mr. James A. Bauml, 130 Melba, San Antonio, Texas 78216, who contributes the most interesting report on the recent plant collecting trip into Mexico with Dr. Howard, writes that he is a sophomore botany major at Texas A & M University, College Station, Texas, and that he is much interested in the Iridaceae and Amaryllidaceae, and that "By trading plants which I have collected or have been given by Dr. Howard, I have built up a small collection of things which continually expands." We wish him all success in his plant activities. It is lucky when one can become interested in plants early in life.

Under date of August 27, 1971, Dr. W. T. Stearn, British Museum (Natural History), Cromwell Road, London, S. W. 7, writes "You may be interested to know that I called at Spofforth this year while on my way to lecture at Harrogate. The Old Rectory in which Herbert lived still stands and, as the whole garden area is walled, it is evident from this that he had ample space for his horticultural enterprises."

Mr. Lindsay J. Forbes, 59 Union Road, Surrey Hills, Victoria, 3127, Australia, is interested in obtaining seeds of *Zephyranthes*, *Habranthus* and other smaller amaryllids. Seeds of native Australian plants will be sent in exchange.

Mr. V. T. Vail, 93 South Terrace, Como, Western Australia 6152, wishes to obtain seeds of *Amaryllis* species. It is hoped that those who have such seeds will share some of these with Mr. Vail.

It is with sadness that I have to report the death of Dr. Robert F. Hoover, May 1970, due to cancer. Dr. Hoover was the authority on *Brodiaea* and allied genera, and received the William Herbert Medal in 1955 (see PLANT LIFE Vol. 11. 1955), for his outstanding contributions to science.

When Mr. J. L. Doran returned from a September 1971 South American plant collecting trip, he brought back examples of three Bolivian postage stamps in full color, depicting *Amaryllis pseudopardina* (=*A. leopoldii*) $b. 1.20 Air Mail; *Amaryllis escobaruriae*, 30 cts., and *Amaryllis yungacensis*, 50 cts. All species native to Bolivia. These are very colorful, and we are grateful to Mr. Doran for presenting the set to the Society.

Mr. B. York, 24 Mulgowie St., Sunnybank, Brisbane, Queensland, Australia, writes under date of April 4, 1971, that he has been growing *Amaryllis* for several years and that he has a fine collection of hybrids. The quarantine laws are so very strict that he has had to grow his plants from seeds obtained from Ludwig & Co., and other breeders in foreign lands.

Mr. Emile P. J. Flauss, 13131 Cherbourg St., New Orleans, La. 70129, is interested in obtaining seeds of *Amaryllis* species, also *Brunsvigia, Clivia, Crinum, Habranthus*, etc. He has seeds of *Crinum americanum* that he can send in exchange.

EDITOR'S MAIL BAG—continued on page 31.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1971 AMARYLLIS SHOWS

On account of very unusual weather conditions, three of the Amaryllis societies in the South Midland could not stage their usual exhibitions. However, a brief report from each has been received, and these are reproduced below.

The 1971 Greater New Orleans Official All-Horticulture Amaryllis Show was held on April 17. Then followed the 1971 Corpus Christi Amaryllis Show on April 17-18, and the 1971 Greater Gulf Amaryllis Show at Mobile, Alabama, on April 18.

The 1971 Southern California Official Amaryllis Show was held on April 24-25, and the 1971 Baton Rouge, Louisiana, Amaryllis Show on April 25.

HOUSTON AMARYLLIS SOCIETY

MRS. A. C. PICKARD,

Official Show Chairman, 1702 North Blvd., Houston, Texas 77006

The Amaryllis bulb is a hardy vigorous and wonderful adaptable perennial but it cannot perform any miracles. The winter of 1971 did queer things to many plants in the Gulf Coast area.

Early spring in February, followed by late winter in March, is a frustrating time for any Amaryllidiarian. Knowing the vagaries of Texas weather, we also know there will be sunny and warm days between the cool frosty nights. We waited expectantly for that first glorious bloom in the garden, a foretaste of the splendor sometime by mid-April, which is usually the ideal time for the Amaryllis show. However, we were disappointed this past April to have had to cancel the show due to climatic conditions and lack of available showroom space on a seasonable date.

In the weeks following, there were garden tours, program meetings and evaluating of Amaryllis growing in pots and gardens. It offered a potential field from which new members were recruited.

The Houston Amaryllis Society gardens will be supplemented by many new outstanding varieties for 1972.

HATTIESBURG AMARYLLIS SOCIETY, 1971

MRS. SAM FORBERT, *1910 Evergreen Lane,*
Hattiesburg, Mississippi 39401

In place of an Official Show in the spring of 1971, the Hattiesburg Amaryllis Society exhibited Amaryllis blooms in the local banks and department stores. Also during Library Week, potted Amaryllis were exhibited in various rooms of the Hattiesburg Public Library. We feel that in exhibiting Amaryllis in this way, we reach people who might not attend the regular flower shows.

THE GREATER HOUSTON AMARYLLIS CLUB

Mrs. Sally Fox, *Corresponding Sec'y., 1527 Castle Court,*
Houston, Texas, 77006

The Houston, Texas, Chamber of Commerce was delighted to report 80 degree weather during January and February, 1971. On the other hand, the local gardeners were disgusted to find buds popping each day they made a tour of their yards. Then, March which is usually mild in the Gulf Coast Area, decided to make up for January and February. The combination of hot weather in the Winter months arousing the bulbs to put up buds, then an extremely cool March gave us very poor quality blooms. Although it was a difficult decision, our Show Chairman suggested we cancel our show since our aim is to promote interest in growing amaryllis, and we would not want to display blossoms of inferior quality to the visitors, even though they would understand the unusual growing conditions which we experienced in our area.

Needless to say, we can't control the weather so the preparatory work to put on our show went for naught, and we will just have to wait and hope for show quality blooms next Spring.

1971 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

Tim Calamari, Jr.
1016 Rosa Ave., Metairie, La. 70005

The Men's Amaryllis Club of New Orleans sponsored their twelfth annual all-horticulture Amaryllis Show over the week-end of April 17 and 18, 1971 at the Lakeside Shopping Center Mall in Metairie, La. The Show attracted well over one thousand visitors, most of whom seemed very favorably impressed by the quality as well as the number of entries.

Mr. Milo Virgin, a perennial winner, again won top honors in the Show. He won the ''Best in Show'' ribbon, the Walter Latapie Award, and the Ludwig Challenge Cup for a nearly perfect specimen of ''Picotee Petticoat.'' He also won the Robert Goedert Award for an outstanding *A. pardina,* the Southern Seed and Popcorn Co., Inc. Award for the runner-up specimen in the Breeder's Class, and the President's Trophy for winning the most blue ribbons overall. Mr. Walter Latapie won the James Mahan Award for a 'Beautiful Lady', the runner-up entry in the named and registered section. Mr. Lester Laine received the Robert Diermayer Memorial Award for the best specimen in the Breeder's Section. Mrs. Sam Norwood was awarded the T.A.C. Construction

Co. Award for the best unnamed and unregistered potted specimen with Mr. Al Diermayer receiving the Edward F. Authement Memorial Award for the runner-up entry in that section. Dr. Tim Calamari, Jr. won the Sweepstakes Ribbon for the most blue ribbons in the registered and named sections. Mr. Al Diermayer received a similar Sweepstakes Ribbon in the unregistered and unnamed sections. Mr. Jerome Peuler, the Club's president for 1970-71, won a Special Trophy for the Best Single Floret, a magnificent 'Golden Triumphator'. Mr. Emile Flauss won the Lloyd Donahoe Award for the best two-floret specimen in a special class of the show.

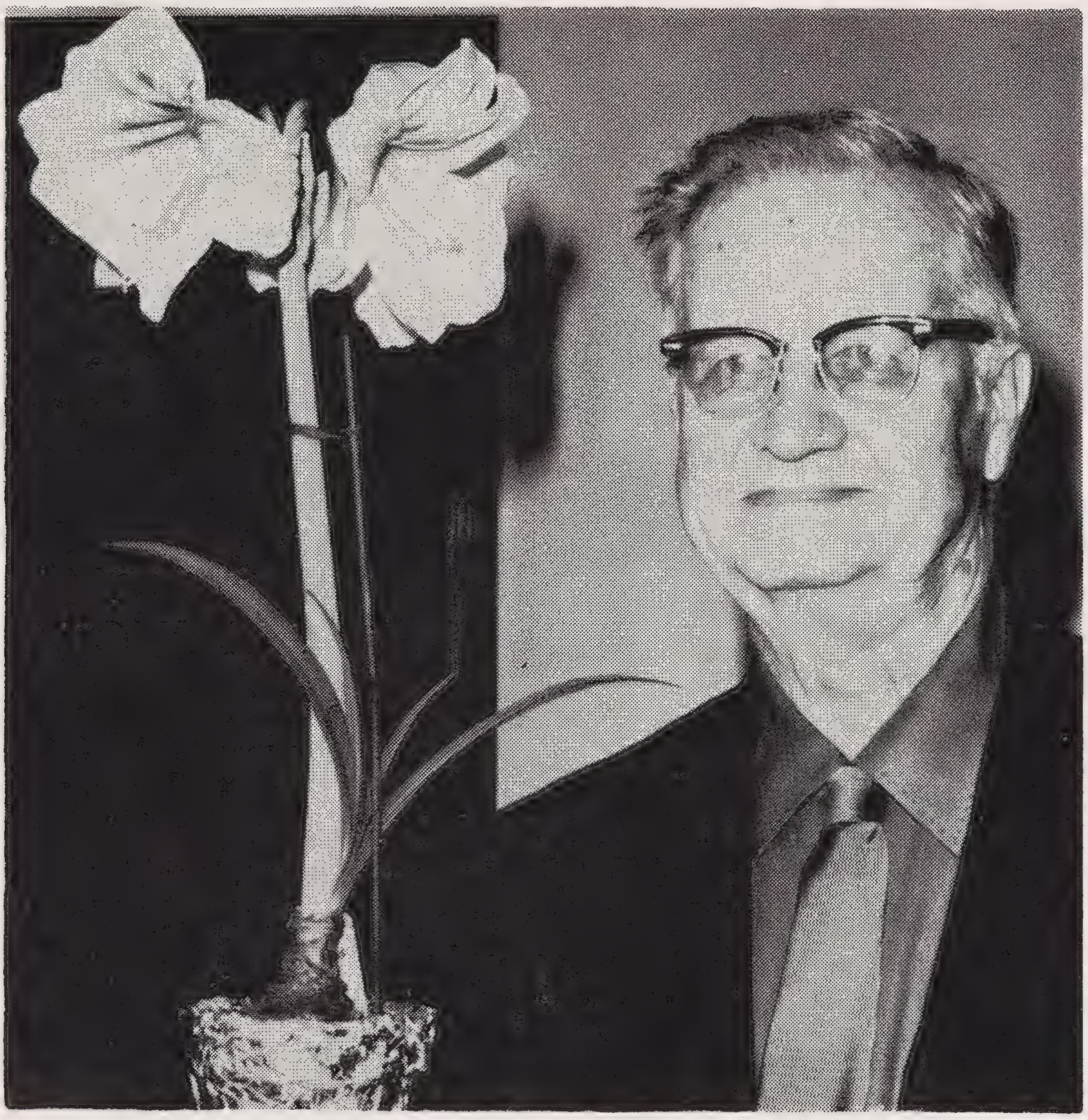

Fig. 7. Mr. Milo Virgin, with prize-winning nearly perfect specimen of 'Picotee Petticoat'.

As can be seen by even a casual glance at the list of winners and awards, there were more and better trophies awarded in the 1971 Official Show than in any past show. This was quite fitting as there seemed to be more and better flowers exhibited at this Show than at any previous show. The Chairman of this memorable 1971 Show was Mr. Lloyd Donahoe. Dr. William N. Palmer, Jr. was Co-Chairman.

CORPUS CHRISTI AMARYLLIS SHOW, 1971

MRS. CARL C. HENRY, *P. O. Box 3054,*
Corpus Christi, Texas 78404

Our Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the ''Festival of Flowers'', held by the Corpus Christi Council of Garden Clubs on April 17th and 18th, 1971, at our Richard King High School this year. We were fortunate to even be able to stage a flower show this year, as Hurricane Celia really caused much damage to our many gardens and flowers—this past August 3rd. Also, our winter season was very mild, which caused many of our Amaryllis and other flowers to bloom during March instead of April. However, we were fortunate in having 39 entries in our Amaryllis Exhibit.

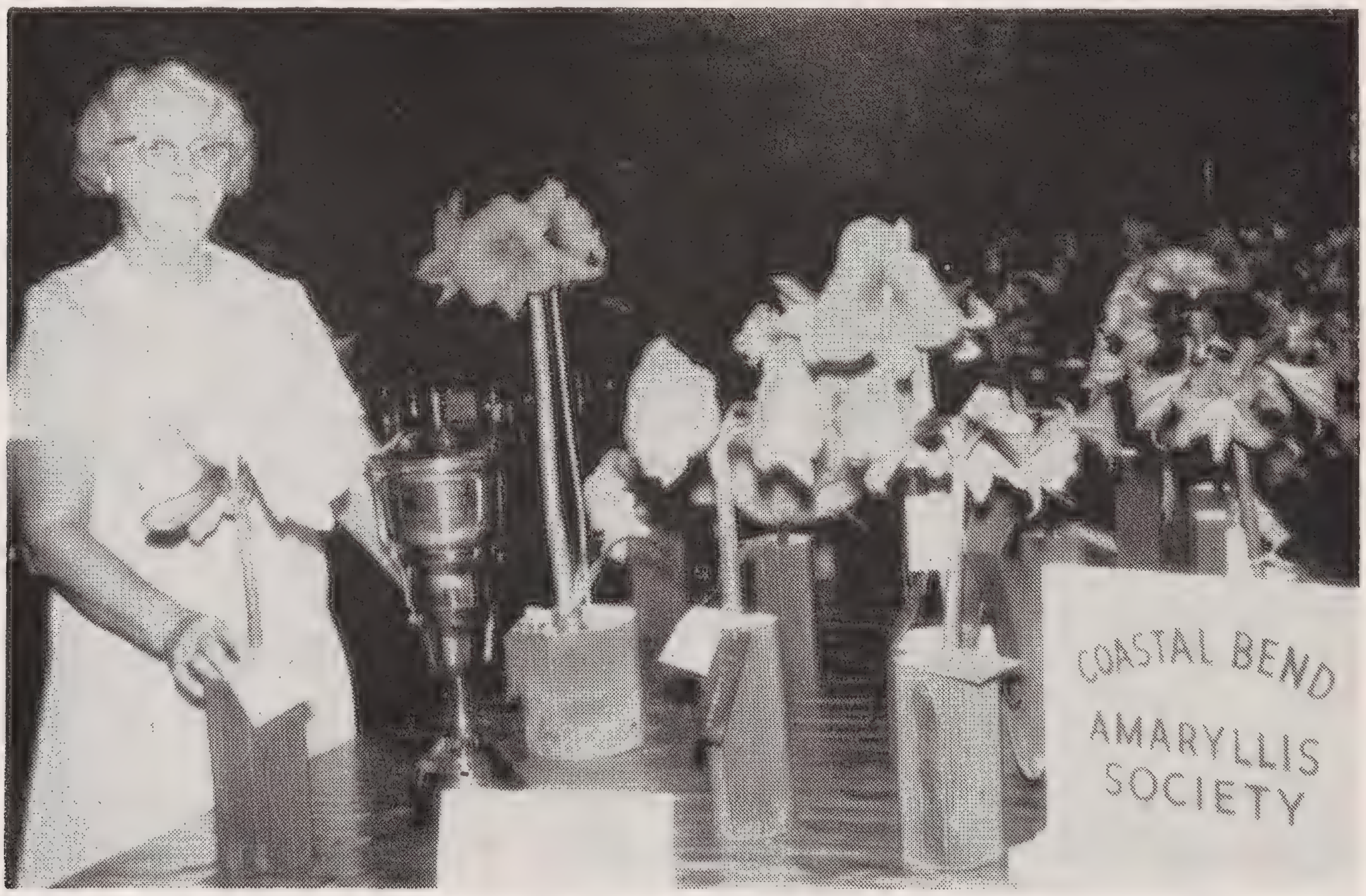

Fig. 8. Mrs. R. A. Hornberger, winner of Ludwig Challenge Cup at the Corpus Christi Amaryllis Show, 1971.

Those entered in the Registered and named Ludwig varieties were: 'Apple Blossom', 'Bouquet', 'Ludwig's Goliath', 'Royal Dutch', and 'Winter Carnival'. Gracilis type blooms entered were 'Carina', Firefly', and 'Little Sweetheart'.

The Ludwig Challenge Trophy was awarded to Mrs. R. A. Hornberger for receiving the greatest number of ''blue ribbons'' in the Ludwig Registered and Named Amaryllis Section. Mrs. Hornberger has been awarded this Challenge Trophy three times now and will be entitled to keep it permanently.

A *''Special Trophy''* to a non-member was awarded to Mrs. Bill

M. Miller, for her entry of 'Royal Dutch', which scored 95 points.

A "*Special Trophy*" to a Club Member was awarded to Mr. R. L. Retallack, for receiving the greatest number of blue ribbons in the "Breeder's Class".

An "*Achievement Trophy*"—*Club Member*—was awarded to Mrs. Levi Materne, for entries in the Registered and Named Leopoldii Amaryllis classes, which were blue ribbon winners.

An "*Award of Merit*" was given to Mrs. Bill M. Miller, by the American Amaryllis Society, for her entry of 'Royal Dutch', which scored 95 points.

Preliminary Commendation Awards given by the American Amaryllis Society, affiliated with the American Plant Life Society, were awarded an unnamed Reginae Hybrid which scored 95 points; Mrs. Phelps entered an unnamed African Hybrid which scored 96 points.

We were unable to secure National Accredited Amaryllis Judges for our show this year, due to a number of other flower shows being held on the same date as ours. Mrs. Walter H. Anderson and Mrs. C. E. Weeks, National Flower Show Judges, served as judges for our exhibit.

1971 GREATER GULF AMARYLLIS SHOW

W. A. McCollum, *President, Amaryllis Society of Mobile,*
57 Hillside Lane, Springhill, Mobile, Alabama

The Amaryllis Society of Mobile presented its 18th Annual Greater Gulf Amaryllis Show in the Mini Mall of Bel Air Mall on Airport Boulevard, Mobile on Sunday, April 18, 1971, from 9 a.m. to 5 p.m. after having been judged by accredited flower judges.

Theme of the show this year was AMARYLLIS TIME IN HISTORICAL MOBILE. Classes in the artistic arrangements carried out this theme.

Two Mobilians took top honors in the show. Mrs. Lois Koontz walked away with nine trophies, and W. A. McCollum, president of the sponsoring Amaryllis Society of Mobile, won five awards.

Mrs. Koontz won the following trophies: Most Blue Ribbons in Show; Most Blue Ribbons in Horticultural Division; Swetman Amaryllis Garden Trophy; Claude H. Moore Memorial Trophy; Wesley J. Marshall Sr. Memorial Trophy; T. J. Swetman Trophy; Inez Scheuermann Trophy and two Amaryllis Society of Mobile trophies.

Mr. McCollum won the John A. Lamey Memorial Trophy; the Robert Hiram Swetman Memorial Trophy; the John J. Mason Memorial Trophy; the Ludwig Trophy and the Amaryllis Society of Mobile Challenge Cup.

Mr. & Mrs. E. A. Wiggins took the Amaryllis Society of Mobile Silver Cup for best potted miniature, the Amaryllis Society of Mobile Trophy awarded for most blue ribbons in unnamed potted seedlings and the Men's Garden Club of Mobile Certificate of Honor.

The First Federal Savings & Loan Association Trophy went to Mrs. C. E. Adams. Mrs. N. K. Bunch of Selma, Alabama took the Amaryllis Society of Mobile Trophy for the most outstanding horticultural cut specimen of American hybrid amaryllis in show, and Mrs. G. R. Montgomery won the Lucy Whitworth Memorial Trophy.

Mr. John Clark was Show Chairman and Mrs. H. O. Hackmeyer was Chairman of awards and trophies. Mr. W. O. Cobb, a former member, acted as Master of Ceremonies.

The show had approximately 350 entries. Many complimentary remarks were made by those visiting the show and it was estimated that several thousand attended from Mobile and the surrounding areas.

1971 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

MRS. DOROTHY ROSE, *Show Chairman*
10300 Rosewood Avenue, South Gate, California 90280

The Southern California Hemerocallis and Amaryllis Society sponsored the Seventh Annual Amaryllis Show April 24 and 25, 1971 at the Los Angeles State and County Arboretum, 301 North Baldwin Avenue, Arcadia, California. The show title "NATURE'S JEWELS" aptly described the beautiful displays of Amaryllis and other members of the Amaryllidaceae. There were 17 competing exhibitors with 105 potted and cut specimens.

THE AWARDS WERE AS FOLLOWS: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy—S. S. Harshbarger; SWEEPSTAKES RUNNER-UP—So. Calif. Hemerocallis and Amaryllis Society Award—Leonard Doran; BEST REGISTERED LUDWIG VARIETY—Ludwig Challenge Cup—S. S. Harshbarger with 'Loves Desire'; The following received So. Calif. Hemerocallis and Amaryllis Society Awards: BEST REGISTERED LUDWIG VARIETY RUNNER-UP—S. S. Harshbarger with 'Nostalgia'; BEST REGISTERED OTHER THAN LUDWIG, LARGE FLOWERED HYBRID—not given this year; BEST REGISTERED OTHER THAN LUDWIG, LARGE FLOWERED HYBRID RUNNER-UPS—Indoor grown—S. S. Harshbarger with 'Rilona'; Outdoor grown—Dr. Spearman with 'La Paloma'; BEST SEEDLINGS LARGE FLOWERED, REGINAE & LEOPOLDII TYPES—Outdoor, cut scapes—Leonard Doran; Outdoor potted—C. D. Cothran; RUNNER-UPS TO THE ABOVE—Indoor grown—S. S. Harshbarger; Outdoor grown—Leonard Doran; BEST REGISTERED GRACILIS—I. K. Rosoff with 'Pretty Pal'; BEST GRACILIS MINIATURE SEEDLING, 1" to 4"—Indoor grown—S. S. Harshbarger with "Sparkling Gem X Voodoo"; Outdoor grown—Roger Fesmire with "Mini Skirt X Tangerine"; BEST BELLADONNA TYPE SEEDLING, 4" to 6"—Quinn Buck with 'Calyptrata hybrid'; NEW SMALL LEOPOLDII, 4½" to 6"—S. S. Harshbarger; HAYES AWARD—S. S. Harshbarger;

BEST FLOWER IN SHOW, FROM JUDGES VIEWPOINT—Judges Award—Tom Humphreys with 'Fire Flame'; POPULARITY POLL WINNER—So. Calif. Hemerocallis and Amaryllis Award—S. S. Harshbarger with 'Nostalgia'; HARSHBARGER AWARD FOR 1971, Highest number of points awarded any flower (99 points).—Tom Humphreys with 'Fire Flame'.

AMERICAN AMARYLLIS SOCIETY AWARDS OF MERIT—Dr. Kelly Spearman with 'La Paloma', S. S. Harshbarger with 'Loves Desire', and Tom Humphreys with one species *Amaryllis petiolata* bulb having three flower spikes with a total of twelve flowers.

AMERICAN AMARYLLIS SOCIETY AWARDS OF PRELIMINARY COMMENDATION: Ed Pencall, a lovely rose-red seedling, S. S. Harshbarger, a blushing pink which scored 93 points and Leonard Doran, a large picotee of Pardina parentage.

Special Ribbons were awarded to Dr. Kohl, Tom Humphrey, Dr. Spearman, S. S. Harshbarger, and Ed Pencall.

A new division for junior growers was added this year to encourage their participation in Society activities. Brian Pencall was the winner of a first and special ribbon.

Rosettes were awarded to Mr. E. A. Angell of Loma Linda and Mr. Bruce Claflin of Upland for supplying a multitude of outdoor grown Amaryllis spikes that aided greatly in making the show a blaze of color and beauty.

Mr. Leonard Doran's educational exhibit explained the growing of Amaryllis from ripened seed pod to clone. The Amaryllis seed sprouted in sealed jars of water excited much comment. Featured was a large map of South America showing the habitat of many Amaryllis species. Leonard Doran and fellow member, Henry Myers, were kept busy answering the numerous questions of the visitors.

The flower arrangements with Amaryllis predominant were noncompetitive this year and awards were not given. Artificial plant material was not allowed, otherwise the members were given free rein to express their skill. The results were placed in vantage points throughout the show and were thoroughly enjoyed by both guests and members. Those participating were Mrs. Ruth Fesmire, Marian Harshbarger, Gladys Williams, C. H. Welborn, and Dorothy Rose.

This year the Society was very fortunate in having two horticultural displays that created an extensive amount of excitement and enthusiasm in both the members and the crowds passing through the show. The displays were a joint venture by Alice Gans of ''Oakhurst Gardens'' and Roger Boddaert ''Landscape Horticulturist''. They were designed by Roger Boddaert to create an educational atmosphere at the show and explore for its viewers the marvels of the Amaryllis family with its complimenting genera and species.

Their largest display 24 feet long was backed by appropriate botanical prints and potted shrubs. Handmade stoneware contained and enhanced the bouquets and living plants of *Agapanthus, Clivia,* and

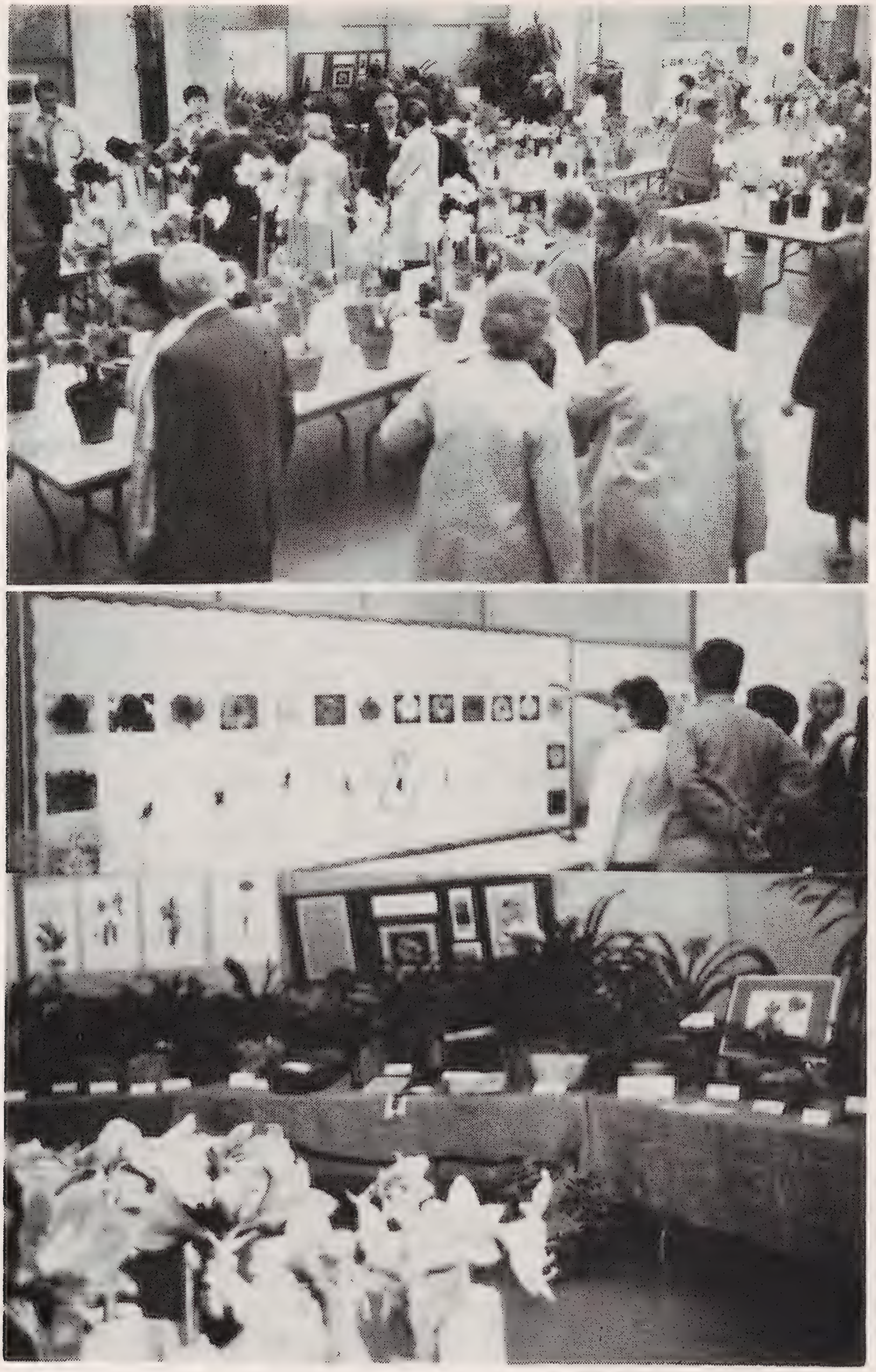

Fig. 9. Southern California Amaryllis Show, 1971. **Top,** partial view of exhibits; **Center,** partial view of Mr. Doran's educational exhibit; and **Bottom,** center section of 24 ft. long display by Alice Gans and Roger Boddaert. Photos by I. K. Rosoff.

Haemanthus featured. The *Agapanthus* section included evergreen types with large flower umbels typified by *Agapanthus africanus* and *A. orientalis,* while three deciduous species were *Agapanthus caulescens, A. inapertus,* and "A. natalensis". One *Agapanthus africanus* form had over 160 florets to its umbel. This exciting genus offers a wide palette of traits for the hybridizer and his camel hair brush to explore. A very representative collection of *Haemanthus* had *Haemanthus katherinae, H. puniceus, H. coccineus, H. albiflos,* and *H. magnificus.* Clivias were *Clivia caulescens, C. nobilis,* both with pendulous florets, *C. Miniata,* and a hybrid between one of the *C. miniata* selections and *C. nobilis* called "Eto" which blooms two to three times a year. The "Yellow Clivia" was featured and excited favorable comment.

With their second display Alice and Roger created a living Amaryllidaceae bouquet composed of many other members in this great family of plants. Living plants and fresh cut flowers with ornamental foliage intermingled were used to create this 7 foot high by 16 feet in length centerpiece. The following were used: *Allium coryi, A. neapolitanum, A. triquetrum, Manfreda maculosa, Sprekelia formosissima, Worsleya rayneri* "The Blue Amaryllis", *Eucharis amazonica, E. fosteri, E. Moorei, Crinum* "Cecil Houdyshel", *Anigozanthos flavida,* and *Narcissus.* The focal point was *Beschorneria yuccoides* with its rosettes of glaucous, blue-green leaves and 6 foot flower spikes of green and blue flowers with bright pink bracts. Both exhibitors received Rosettes and the sincere appreciation of the Society members.

Two blooming Amaryllis plants were given as door prizes. One by the Society and the other donated by Ed Pencall.

The certified judges were Mrs. Bert Williams, Mrs. Kenneth Anderson, Mr. Roger Fesmire, Mr. Quinn Buck, and Mr. Hugh Bush of Kansas City, Mo.

Clerks were Leonard Doran, Charles Hardman, S. S. Harshbarger, Henry Myers, and Joe Werling.

Sincere thanks are given to Mr. I. K. Rosoff, photographer and Mr. Joe Werling for printing the Show Schedules, cards, and signs.

More than 3640 attended the show and the congratulations and enthusiasm of the visitors gave ample evidence that our Society is accomplishing its objective—to stimulate a greater interest in and knowledge of Amaryllids.

1971 BATON ROUGE AMARYLLIS SHOW

Joseph K. Mertzweiller,
9266 N. Parkview Dr., Baton Rouge, La. 70815

The Baton Rouge Amaryllis Society held its 1971 official show on April 25 at the Downtown Recreation Center. The show chairman was Mr. De Lee Crum, with Mr. Ken Campbell as assistant chairman. Staging of the show was done in conjunction with the Baton Rouge Men's Garden Club Spring Flower Show. Considering the somewhate late date and a very dry spring which adversely affected the outdoor-grown

Amaryllis the show was quite gratifying to all our members. Approximately 100 potted Amaryllis, covering the principal classes, were shown by more than a dozen exhibitors. A pleasing and eye-catching exhibit of single florets was limited to society members only. Most of these were outdoor grown. Eight prizes in silver adorned the awards table. We estimate some 300-400 people saw the show during the one afternoon it was open to the public.

The judges awarded the Ludwig Challenge Cup to Mr. Al Diermayer for a very good bloom of 'Carousel'. Al also won another silver award for the Best Small Flower, a mist green miniature of unknown origin and only about 2 inches in diameter. The award for the Best Registered Flower went to Mr. Ed Beckham for a fine specimen of 'Eastern Dream'. The award for the Best Intermediate Flower also went to Ed for a nice pure white seedling. Ed Beckham also won the Potted Plant Sweepstakes. The Hybridizers Award for the best Leopoldii Class seedling was won by Mr. Ted Tower for a beautiful salmon pink seedling. Mr. De Lee Crum won the award for the Best Single Floret while Mr. Jake Schmidt took the honors for the Cut Scape Sweepstakes.

The Baton Rouge Amaryllis Society instituted a new award in 1971: the Fred J. Buchmann Memorial Award. This award is given for the best hybrid having an Amaryllis species as a parent and is to recognize the great interest and accomplishments of the late Dr. Buchmann in growing and hybridizing with the Amaryllis species. The inaugural award went to Mrs. Fred J. Buchmann for a beautiful pink hybrid.

Our organization wishes to express its appreciation to the Men's Amaryllis Club of New Orleans for the many kindnesses and help given us during the year of 1971 and on occasion of the show. We all look forward to a bigger and better show in 1972.

EDITOR'S MAIL BAG—continued from page 21.

Ir. C. Vonk Noordegaaf, Research Station for Floriculture, Linnaeuslaan 2a, Holland, writes that he is collecting *Alstroemeria* species for research work on response to length of day, temperature, and so on, and also for breeding work. He has 20 species and is trying to obtain more. He would be interested in exchanging species with others having species that he lacks.

Mr. Claude A. Barr, Prairie Gem Ranch, Smithwick, South Dakota 57782, writes under date of Nov. 26, 1971, ''We regret that the current issue of our catalog is exhausted. Our long-time book project, treating of the remarkable, varied and beautiful native flora of the Great Plains of garden interest, under the name of ''Jewels of the Plains'', must be completed within a year, and announcement of publication will be duly made. No. catalog of plants or seeds is planned for the fall of 1971 or the spring of 1972.''

EDITOR'S MAIL BAG—continued on page 67.

PLANT LIFE LIBRARY—continued from page 4.

HOW TO GROW AFRICAN VIOLETS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 1971. This edition of a standard text has been completely revised to include many new hybrids and variations. The sections are devoted to the natural beauty of African Violets, guidelines for healthy growth, versatile plants for indoor decoration, propagating methods, African Violet cousins, grooming and exhibiting African Violets, and catalog of African Violet varieties. Highly recommended.

TIME-LIFE ENCYCLOPEDIA OF GARDENING SERIES, edited by James Underwood Crockett and editors of Time-Life Books. In every case the volumes are profusely illustrated in color. The individual volumes are distributed by Little, Brown & Co., Boston, Mass. Library and school edition, by Silver Burdett Co., Morristown, N. J. 07960.

1. ANNUALS, with water color illustrations by Allianora Rosse. 1971. Pp. 176. Illus. $6.75. The subject is considered under (1) living color the summer long, (2) how to grow annuals, (3) bringing outdoor beauty indoors, (4) a head start for the flower garden, and (5) an illustrated encyclopedia of annuals. Highly recommended.

2. ROSES, with water color illustrations by Allianora Rosse. 1971. Pp. 160. Illus. $6.95. The subject matter is grouped under (1) the Queen of Flowers, (2) planting, pruning and protection, (3) creating better blooms, and (4) an illustrated encyclopedia of roses. Highly recommended.

3. FLOWERING HOUSE PLANTS, with water color illustrations by Allianora Rosse. 1971. Pp. 160. Illus. $6.95. The text has been confined to those plants that are in flower over long periods or are recurrent blooming. The sections are devoted to (1) the pleasures of gardening indoors, (2) providing light and water, (3) soils, pots and potting, (4) the basics of day-to-day care, (5) propagation, and (6) an encyclopedia of flowering plants. Highly recommended.

4. LAWNS AND GROUND COVERS, with water color illustrations by Allianora Rosse. 1971. Pp. 159. Illus. $6.95. The subject is treated under the following headings: (1) the lore of lawns, (2) how to take care of your lawn, (3) repairing old lawns and building new ones, (4) choosing and growing ground covers, and (5) an illustrated encyclopedia of grasses and ground covers. Highly recommended.

5. LANDSCAPE GARDENING, with water color illustrations by Rebecca A. Merrilees and Barbara Wolff. 1971. Pp. 160. Illus. $6.95. The subject is developed under the following headings: (1) what landscaping can do, (2) the outdoor family room, (3) a welcoming fruit yard, (4) places for work and play, and (5) an encyclopedia of selected plants for landscaping. Highly recommended.

PLANT SPECIATION, by Verne Grant. Columbia Univ. Press., 440 West 110th St., New York, N. Y. 10025. 1971. Pp. x+435. Illus. $15.00. This stimulating book is complementary to Dr. Grant's previously published contributions in this field. It is concerned with evolution at the species level, and species groups in higher plants. After a discussion of the nature of the species, the divergence of species, refusion and its consequences, derived genetic systems, and evolution of hybrid complexes, are considered in detail. A bibiography, and organism, author, and subject indices complete the volume. This excellent text by an outstanding authority in this field cannot be too highly recommended to all who are interested in biology.

PLANT LIFE LIBRARY—continued on page 68.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

CRINUM THAIANUM J. SCHULZE, A NEW AQUATIC SPECIES FROM SOUTHEAST ASIA

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This article was completed and transmitted to the Editor of PLANT LIFE in March 1971 when the 1971 issue of that publication was in the page-proof stage. Since the next issue would not appear for another year the Editor kindly ''squeezed-in'' a technical description of the species in Latin in the 1971 edition of PLANT LIFE (Schulze, 1971) so as to avoid any possible question about priority. The complete article is reproduced here.

Crinum thaianum Joachim Schulze

in PLANT LIFE 27: 127. 1971. Holonomenifer: No. 1007(TRA), J. Schulze, Apr. 18, 1970; isonomenifer: No. 1010, J. Schulze, Apr. 18, 1970, deposited in the U. S. National Herbarium (US); Figures 10, 11, 12, and 13, of the present article

Distribution: South Thailand, western coastal region from Taku Pa to the vicinity of Kapoe (see Fig. 11).

I. INTRODUCTION

In September 1966 I recognized in the tank farm of Mr. Kor Song Heng, of the Chao Phraya Aquarium, Bangkok, Thailand, amongst a comprehensive collection of indigenous water plants from Thailand, a member of the genus *Crinum* with long strap-like leaves and the typical bulb, growing in good condition completely submerged in the water. This was surprising to me, because I knew according to Wendt (1958) that within the whole genus of *Crinum* only three species were reported as true aquatic plants. These had been stated to be *Crinum aquaticum* Burchell, which perhaps might be identical with *C. campanulatum* Herb. de Wit (1971) and *C. natans* Baker, both from tropical Africa, and *C. purpurascens* Herb. from Brazil and the West Indies. Prof. de Wit, a famous contemporary authority on water plants, mentions as an additional aquatic species *C. capense* Herb., known also under the synonym of *C. longifolium* Thunb. [According to Dr. Traub, these names are synonyms of *Crinum bulbispermum* (Burm.) Milne-Redhead & Schweickerdt, a terrestrial plant.] The description of these plants in the literature did not correspond with the appearance of the plant I had found in Thailand. Moreover, the probability was not very high that the species from Africa and South America were also native to southern Thailand. Another distinction according to the ecological environments from Koshimizu (1938) registers 7 marsh or stream-side species from a total of 164 acknowledged species of the genus, the remainder comprising 16 inland terrestrial plants and the majority of 141 littoral plants. However, within the interesting group of marsh and stream-side plants it was not clear how many of them would behave as typical and mostly submerged water plants and how many would be merely bog plants which are occasionally flooded.

Unfortunately my further literature investigations could not solve the problem. Besides the well known works of Baker (1888) and Uphof (1942) I had to consult the study on the phytogeographical distribution of the genus by Koshimizu (1938) as well as the floristic handbooks covering the immediate or surrounding areas where the plant was discovered, i.e. especially the reports on *Crinum* in the Flora of Indochina Gagnepain (1934) and in the Flora of the Malay peninsula Ridley (1924) because comprehensive treatments of the plants from Burma or from Thailand itself are not yet available. The extracted information from those sources have been condensed in Table 1.

Table 1. **Crinum** species reported from Southeast Asia, according to Koshimizu (1938), Uphof (1942), Gagnepain (1934) and Ridley (1924). The new species is included under Subgenus Platyaster in brackets [ ].

Geographical	Subgenus			
area	Stenaster	Platyaster	Codonocrinum	not specified
Burma	**asiaticum** L. var. **procerum** Carey		**latifolium** L.	**erythrophyllum** Carey
	defixum Ker-Gawl.		**stapfianum** Kraenzl.	**stenophyllum** Baker
Indochina	**serrulatum** Baker			**cochinchinensis** Roem.
	asiaticum L.			
	defixum Ker-Gawl.			
Malay Peninsula	**asiaticum** L.	**northianum** Baker		**bancanum** Kurz
	defixum Ker-Gawl.	[**thaianum** J. Schulze]		

Three species belong to the section Stenaster, including the widely distributed *C. asiaticum L.* and *C. defixum* Ker-Gawl.; two species belong to Codonocrinum and only one belongs to the section of Platyaster. Four species are not certain and could not yet be placed in a definite section. Later it was recognized that the new *Crinum* species belongs to Platyaster, so that a comparison with *C. northianum* would nearly have been sufficient. This plant, however, has a completely different appearance and is reported to be found in the Malayan provinces of Kedah and Kelantan as well as in Sarawak (North-west Borneo). There I saw *C. northianum* Baker growing to a height of over 2 meters mostly emersed as a bog plant on the banks of the Krian river near Saratok.

II. COLLECTING HERBARIUM SPECIMENS

On my first trip to southern Thailand in 1966 I found the new plant in the (shaded area) as indicated on the map (Fig. 11) flowering in abundance. Merely by means of my description and a few photographs Dr. Hamilton P. Traub immediately expressed his opinion that the plant was not yet known to science in a letter of Dec. 1968, but in order to be certain I had to provide him with an herbrarium specimen, including flowering material. My attempts to procure this through my Thailand friends were not successful and so I had to travel to southern Thailand a second time myself in April 1970. But then I missed the flowering season and after searching over quite an extended area I found only two specimens with flowers, which were collected and pressed. When Dr. Traub had received this material he confirmed his original statement in a letter of Jan. 1971 that apparently it could not be with any other known species of the genus.

III. THE PLANT IN ITS NATIVE HABITAT

Description.—*Crinum thaianum* is a true aquatic plant growing mostly submerged and only seldom are there slightly discernible characters of amphibic behaviour which is typical for most water plants. It lives in running waters. The shape of the long strap-like leaves excellently fits it for these conditions causing only little resistance to the water current. There are 20 or more leaves, light green in color, sheathing below the bulb neck. The maximum width of the older, outer leaves of the whorl is around 2,5 cm, but mostly the width is only between 1,5 and 2 cm and scarcely changing on the whole length of up to 2 or even 3 meters. One can discern 22 to 26 longitudinal veins, the distance between them diminishing towards the margin. Irregular interconnecting cross veins are distinctly visible only along the central section of the leaf.

The structure of the leaves is tenacious, soft and flexible, which is in contrast to the more stiff and brittle leaves of *Vallisneria gigantea* Graebner, a water plant from the family *Hydrocharitaceae* with only superficial resemblance in respect to the long ribbon shaped leaves. While the leaves of the latter ''Giant Vallis'' ascend straight from the roots, one can often observe that the leaves of *Crinum thaianum* J. Schulze bend towards the horizontal direction shortly above the bulbneck (Fig. 13). The leaf blades of the *Vallisneria* are plain, those of *Crinum thaianum* are often slightly curved in cross-section and are twisted with respect to the young, central leaves. Small teeth appear on the margins of the leaf blades. When during extremely dry periods some plants in very shallow river sites have to expose the leaves to emersed, dry conditions, the size is reduced considerably.

The bulbs are up to about 7 cm in diameter and 15 cm in height together with the lower basal plate bearing the roots. The upper part

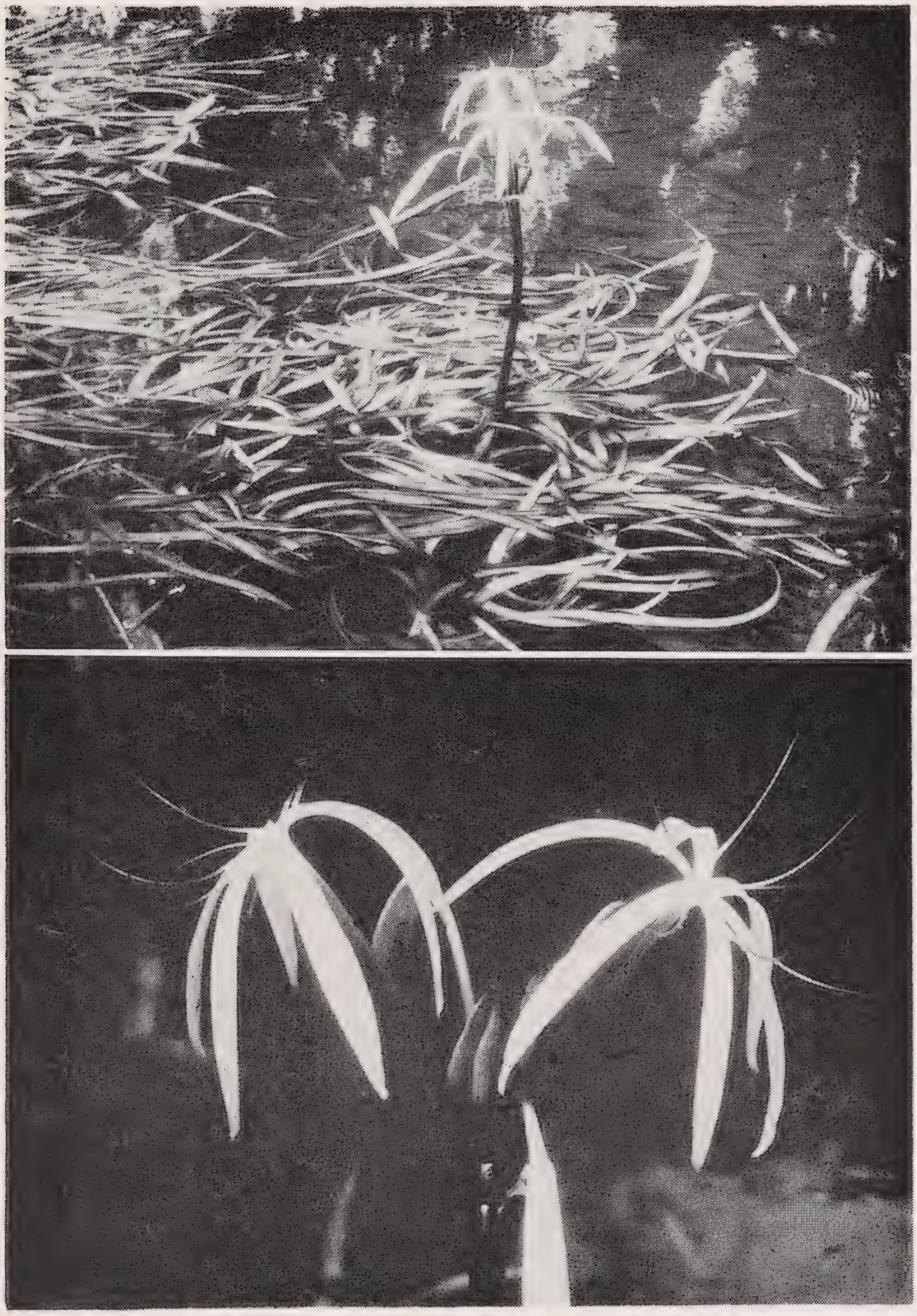

Fig. 10. **Crinum thaianum** J. Schulze, **Upper,** in native habitat, showing leaves and flower scape. **Lower,** close-up of flower scape. Nomenifer illustration. Photos by J. Schulze.

is elongated into a neck, both parts measuring from 3 to 6 cm in length, sometimes more. I found a plant with a neck and stem measuring 8 cm in length, then widening to a second smaller upper swollen region with a neck above it, so that the distance between the origin of the roots and the leaf sheaths totaled 23 cm. Numerous strong primary roots spread from the bulb; these are up to 3 mm thick and 30 cm long, branching freely into secondary roots (Fig. 13). Consequently the plants are rooted deeply in the ground of the rivers. To remove a plant from a depth of half a meter under the bottom is extremely difficult and laborious so that many attempts at digging it out end with the tearing off of the leaves. Occasionally one can find one or two small baby bulbs connected as offsprings with the mother bulb indicating also asexual, vegetative propagation, which seems to be important for cultivation and propagation under artificial conditions, under which the chances of flowering the plant are very low.

When the plants are exposed to the current in the middle of the river beds or generally during the time of high water one can see a huge mass of leaves floating near the surface of the water performing a steady winding movement. When the water level is low and in the quiet boundary zones of the rivers the leaves are curled and packed irregularly in the water (Figs. 10 & 12). Scattered green patches in the water indicate numerous plants clustering densely together, which may result from vegetative propagation and even more from the sticking of seeds to the dense foliage of already existing crowded plants.

The marvelous flowers are quite exceptional in comparison to what is known in the water plant world, as normally water plants develop only tiny and insignificant flowers. Mainly during the monsoon rain period from August to October the waterways are studded with the big and brilliant white umbels of that *Crinum* species. From the center of the leaf whorl develops a rather stout scape, 5—8 mm thick and up to 80 cm long, the colour of which may be described to be dark green to brown. At the top it bears the flowers within an umbel surrounded by spathe-valves in changing elevations from just a few centimeters to half a meter or more above the water surface. The umbels are comprised mostly of from 5 to 8 and rarely up to 10 flowers; 1 to 3 mostly being open at the same time. The tube is 12 to 14 cm long, light green color in the lower and white color in the upper part. The tube divides into 6 limbs tepalsegs of bright white color. These are reflexed, as can be seen from Fig. 10, narrow linear to lanceolate, 8—10 cm long and up to 8 mm wide. The dry specimens reveal up to 12 mostly parallel and only rarely branched dark coloured longitudinal veins. The six slender, upright erect and spreading filaments are 6—8 cm long, red colored, bearing the linear, dorsifixed 12—14 mm long anthers. The style remains shorter than the filaments.

The seeds are irregular, rounded as well as angular in shape, about 2,5 cm long and carved with some wrinkles on the corky testa. After germination one can raise young plants with 3 or 4 leaves and 30—40 cm in length easily in the tank within about 2 months (Fig. 13).

Distribution.—My field surveys revealed the geographical distribution of the species in the western coastal region of south Thailand along the coastal road connecting Bangkok and Singapore, limited within the section of Ranong in the north (Victoria point, border line with Burma touching the sea) and Takua Pa, famous for tin mining, in the south. More exactly the localities stretch from 25 km to about 90 km northbound from Takua Pa (Fig. 11), including the villages Ban Tamnak, Ban Nang Yon, Ban Nam Phru and the southern vicinity of Kapoe. The longitude is between 98,4° and 98,5° east, the latitude between 9,1° and 9,6° north. Reference to the villages on the map should be considered on the basis that in the field one can hardly distinguish anything more than some scattered huts in the realms of the jungle, near to rubber plantations or paddy fields.

The narrow coastal plain is inserted between the sea in the west, i.e. the Indian ocean, and the mountain range of the Malayan peninsula in the east, the mountains in that area ascending as high as 1,400 m. The area is well known for receiving the heaviest rainfall from the monsoon, feeding the numerous waterways draining down from the jungle covered mountains. The new *Crinum* species lives in pure fresh water streams, varying in size from tiny creeks to rivers 20 m. wide or more (Fig. 12). The water is mostly crystal clear and extremely soft. The temperature of the water was measured to be 27° C in April at noon. The plants grow in rich loamy sand, mixed with coarse gravel to a hard ground. Other places are so rich in loam and weak mud that one sinks deeply when walking through the rivers. When the small creeks are overcrowded with trees, shrubs and the common bamboo vegetation, the plants grow mostly well shaded. However, some exposure to full light and sunshine at least temporarily seems to be received everywhere. As accompanying water plants I saw the genus of *Blyxa* from the family *Hydrocharitaceae* and the genus of *Cryptocoryne* of family *Araceae* represented with a very few species. Altogether these plants seem to have adapted themselves to rather specialized ecological conditions which the majority of other water plants are not able to share. The depth of the water where the *Crinum* is found varies between a few centimeters and two meters or more, depending on the type of river, the elevation of different river sites under the water, and the seasonal water level.

IV. **CRINUM THAIANUM** AS AN AQUARIUM PLANT

The plant is grown successfully in the tropical aquaria, in the heated garden pond and in water tanks of greenhouses. In Berlin I distributed some imported specimens to several aquarium hobbyists. After about three years some of the plants had developed to a marvelous and decorative size (Fig. 13). The "Water Lily" from Thailand grew in old sandy ground enriched in the fish tank by that time with feedingstufs of various origins. Much more abundance of growth, however, is achieved by the addition of some loam clay and peat to the ground. With respect to the size of the bulb and the large network of roots the ground layer in the tank should exceed the minimum height of 10 cm. Fluorescent lamps should provide enough light during at least 12 hours a day. The plant is suitable and a nice decoration for the show aquaria, where it should be placed at a central point in the foreground.

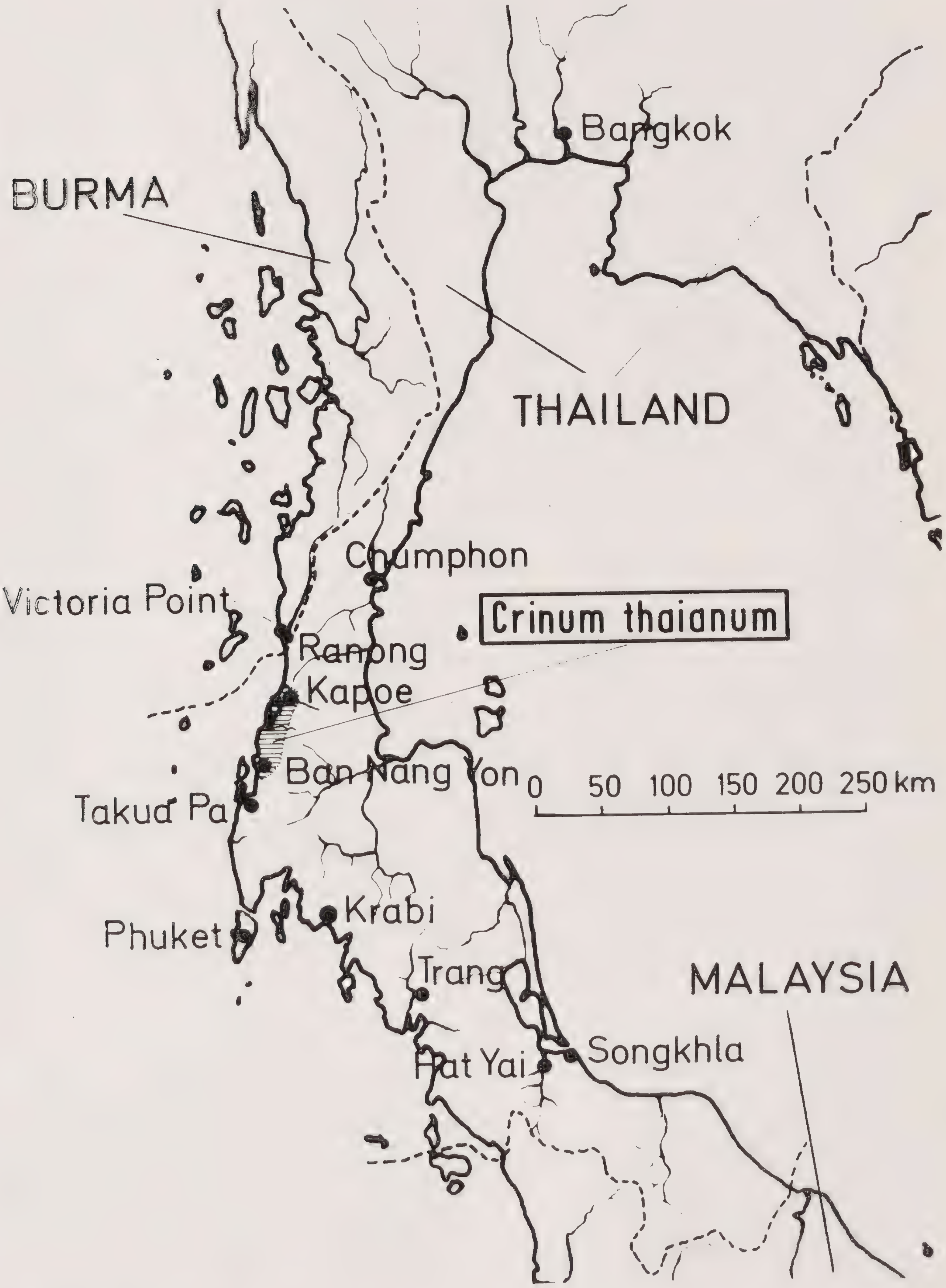

Fig. 11. **Crinum thaianum** J. Schulze, map showing geographical distribution of the species; indicated by shaded area, ranging from Takua Pa to Kapoe in the coastal region of South Thailand.

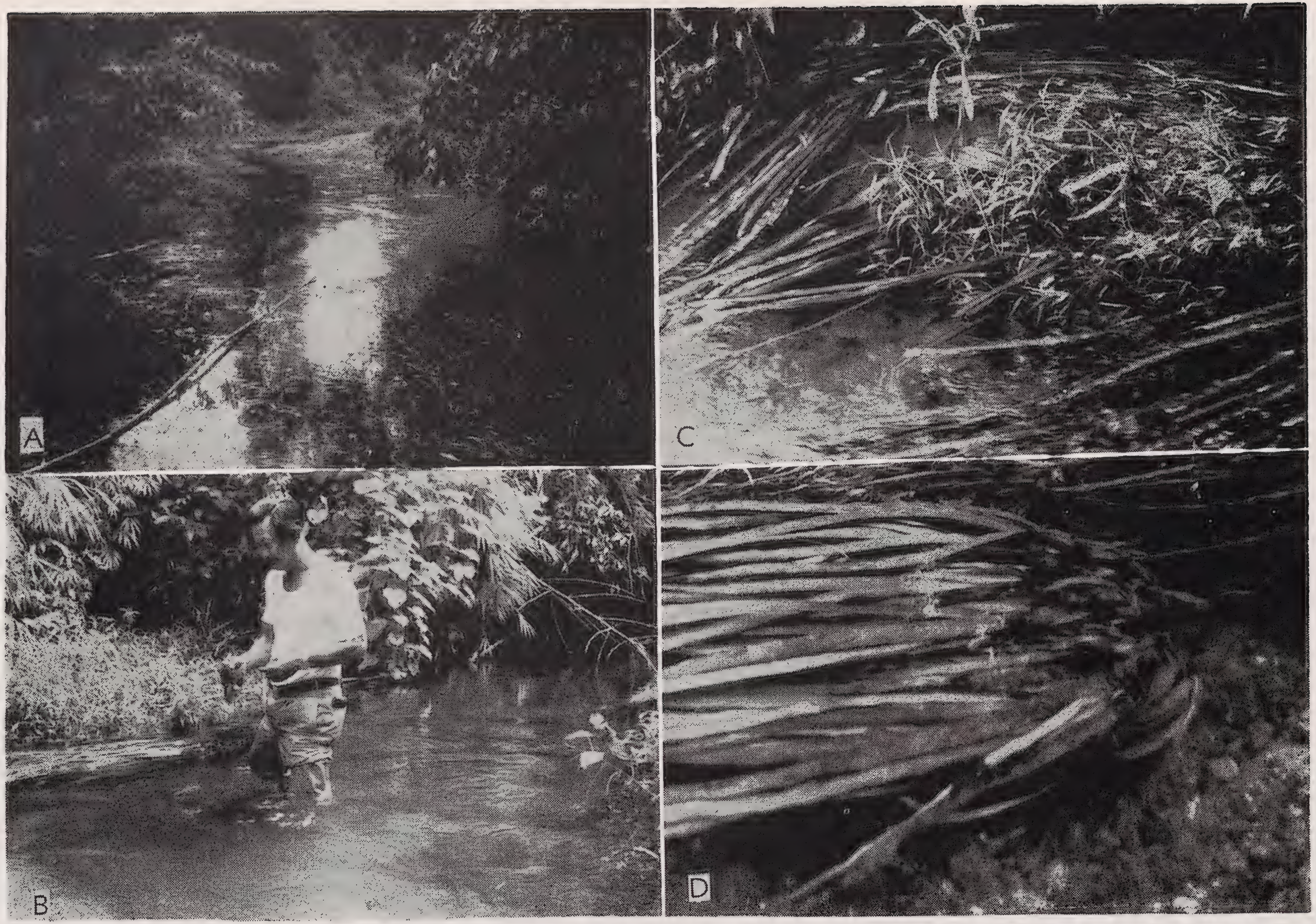

Fig. 12. **Crinum thaianum** J. Schulze in its native habitat. **A,** Broad river of the coastal plain, filled with **C. thaianum;** during the dry season; **B,** Mr. Kor Song Heng, in jungle creek, with C. **thaianum;** C, the long strap-shaped leaves floating in the current of a shallow creek, under 2 m. wide; note flower scape; and **D,** plants rooted deeply in hard bottom, a mixture of loam and coarse gravel, securely anchored against the river current. **Photos by J. Schulze.**

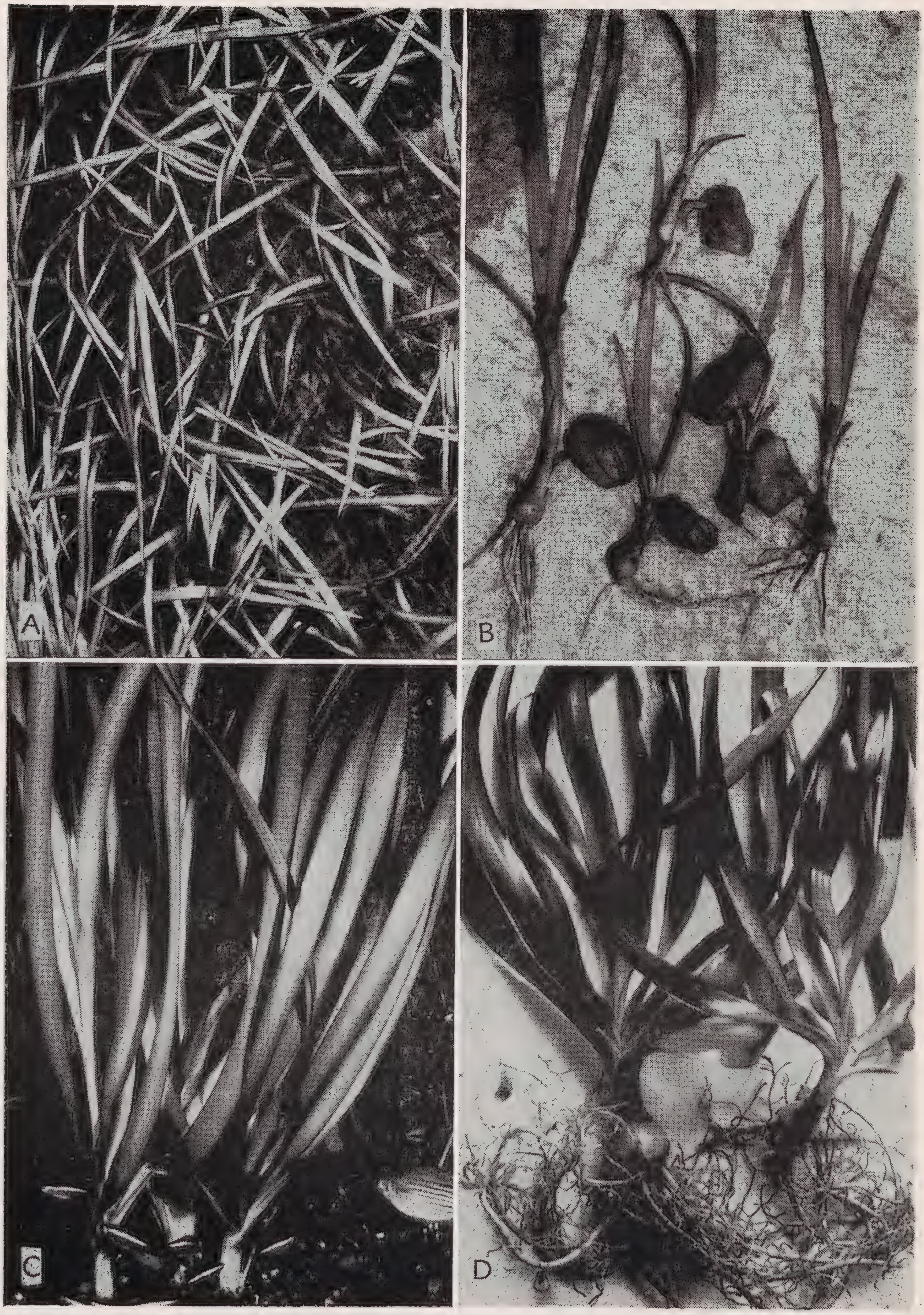

Fig. 13. **Crinum thaianum** J. Schulze as an aquarium plant, **A,** tank with seedlings, cultivated by Chao Phraya Aquarium, Bangkok; **B,** seedlings with attached cotyledon; **C,** 3 year old seedlings; and **D,** two specimens, showing development of roots. Photos by J. Schulze.

It was observed that under artificial tank conditions, baby bulbs will grow after some time of cultivation. When I offered the plant to several botanical gardens, the caretakers would not believe the fully aquatic character of this plant due to other experience gained with *Crinum* species. Trying to keep it as a terrestrial plant in the tropical greenhouse or within special glass casings providing nearly 100% humidity in the air proved to be a failure, as the foliage was curtailed to steadily diminishing size until not much more than the bulb was left. After putting that bulb into a tank under water the wonderful bright green foliage developed anew within a short time.

In the field the plant is not easily collected on account of its deep fixation in the ground. The size and weight of full grown plants are not favorable for export by air transport. Above all in order to preserve our natural resources it is commendable that Chao Phraya Aquarium in Bangkok has introduced the commercial propagation from seeds, which are collected in the field and then raised to young plants for export (Fig. 13). Some experts of water plant nurseries, however, fear that the plant will be accepted by the public for tank use only slowly because of its resemblance to the already well known and widely used giant *Vallisneria* mentioned above.

V. ACKNOWLEDGEMENT

I should like to express my indebtedness and gratitude to Dr. Hamilton P. Traub for his invaluable help in the scientific determination of the plant.

LITERATURE CITED

Baker, J. G. Handbook of Amaryllideae. London. 1888.

de Wit, H. C. D. Aquarienpflanzen. Stuttgart. 1971, p. 52.

Gagnepain, F. Amaryllidaceae, in Leconte, H. (ed.), Flore Generale de L'Indo-Chine. Vol. 6. part 5. Paris. 1934. p. 685.

Koshimizu, T. Phytogeographical distribution of *Crinum* throughout the world. Bot. Mag. (Tokyo) 52 (1938), p. 32.

Ridley, H. N. The Flora of the Malay Peninsula. Vol. 4, London. 1924. p. 300.

Schulze, Joachim. *Crinum thaianum* J. Schulze, sp. nov. Plant Life 27: 127. 1971.

Uphof, J. C. Th. A review of the species of *Crinum*. Herbertia 9: 63. 1942.

Wendt, A. Die Aquarienpflanzen in Wort und Bild. Stuttgart. 1952-1958. p. 154, 258.

NOTES ON THE LATICIFERS OF **ALLIUM, CALOSCORDUM, NOTHOSCORDUM, TRISTAGMA,** AND **TULBAGHIA**

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ABSTRACT

A study of the bulbs of **Allium, Caloscordum, Nothoscordum, Tristagma,** and **Tulbaghia** shows that all are structurally similar in having subepidermal laticifers in the foliage leaves or the scale leaves. Some biochemical differences exist: starch is present in the scale leaves of **Nothoscordum, Tristagma,** and **Tulbaghia** but absent from **Allium** and **Caloscordum**; the contents of the laticifers of **Tulbaghia** have a unique, deeply-staining latex.

A comparative study of the laticifers of the bulbs of different species of *Allium* (from the northern hemisphere) has recently been published (Huang and Sterling, 1970). The summary data of that study are presented here in Table 1. Bulbs of the related plants, *Nothoscordum bivalve* (L.) Britt. from both Mexico and Chile, *Caloscordum neriniflorum* Herb. from E. Siberia to Mongolia, China, and Japan, *Tristagma uniflorum* (Lindl.) Traub from Argentina, and *Tulbaghia fragrans* examined. The findings of that examination are now reported (Table Verd. from So. Africa, all donated by Dr. H. P. Traub, have also been 1).

The bulb scales of *N. bivalve* are distinguished by amyliferous parenchyma, but no starch is present in the bulbs of *C. neriniflorum.* On this basis, Traub's (1963) maintenance of *Caloscordum* as a distinct genus is valid. (It is worthy of note that starch is also lacking in the bulbs of *Allium.*) The more or less narrow, longitudinally arranged laticifers of *Nothoscordum* and *Caloscordum* resemble those of *Allium*, subgenus Amerallium, in the small number of pits in the end wall; they resemble those of *Allium*, subgenus Allium, in their deeper position—at least 2 cells below the epidermis (Fig. 14-A and Table 1). The laticifers of the Mexican specimens of *N. bivalve* can only be found in the young foliage leaves of the bulb, not in the storage leaves. In this respect their distribution resembles that of the laticifers of *A. subhirsutum* of the section Molium (in *Allium*, subgenus Amerallium), described by Saghir (1964).

The laticifers of *Tristagma* occur in the fleshy regions of the smaller bulb scales about the young foliage leaves, where they are distributed along both adaxial and abaxial surfaces. They are located two cells below the epidermis, usually singly but sometimes in pairs, and are surrounded by amyliferous parenchyma.

Starch is also present in *Tulbaghia* (Fig. 14-B and C), in which the laticifers are recognized by their unique, deeply-staining latex, a feature already noted by Menz (1910). These laticifers occur near both the adaxial and abaxial surfaces on the fleshy side of the concentric bulb scale but are only found at the abaxial surface along the thin side of the scale. Note that their position can be rather deep, to 5 cells below the epidermis (Fig. 14-B). They occur singly for the most part but may be found occasionally in twos.

Table 1. Laticifers in **Allium** and related genera

	Anatomical features of laticifers				
Genus, Subgenus (SG), Section (S)	Position[1]	Number[2] in contact	Callus[3] on lateral wall	Swelling[3] of cell end	Cross[3] connections
Allium					
SG: **Amerallium**					
S: Amerallium	1	1—2	0	0	0
S: Lophioprason	1	1—11	0,+	+,0	0
S: Ophioscordon	1	1—2	0	0	0
S: Molium[4]	1	1	—[5]	—[5]	—[5]
SG: **Allium**					
S: Rhizirideum	2—3	1—2	0,+	+,0	0
S: Melanocrommyum	Random	1—4	0	+	+
S: Allium	2—4	1—2	0	+	0
S: Cepa	2—6	1—3	+,0	+	0
Nothoscordum[6]					
bivalve	2—4	1	0	0	0
Caloscordum[6]					
neriniflorum	2	1—2	0	+	0
Tristagma[6]					
uniflorum	2	1—2	—[5]	—[5]	—[5]
Tulbaghia[6]					
fragrans	2—5	1—2	0	+	0

[1] Number of cell layers below epidermis
[2] Number of laticifers side by side in a row
[3] Presence: +, Absence: 0 (if both symbols shown, first is more frequent)
[4] Data from illustrations of foliage leaf cross sections in Saghir (1964): **A. roseum, A subhirsutum, A. zebdanense**
[5] Longitudinal sections not seen
[6] Listed by species

Lindley (1853) segregated *Allium, Caloscordum, Nothoscordum,* and *Tristagma* in the tribe Scilleae (Liliaceae) and put *Tulbaghia* in the tribe Anthericeae of the same family. Krause (1930) and Hutchinson (1934) also kept *Nothoscordum* and *Tristagma* in the same tribal alliance (Allieae) with *Allium* but assigned the genus *Tulbaghia* to the Agapantheae (equivalent to Lindley's 1853, Hemerocalleae), Krause keeping these two tribes in the Liliaceae and Hutchinson placing them in the Amaryllidaceae. However, Traub (1963), seeing a much closer relationship among these genera, included all of them with several other genera in the Amaryllidaceae, subfamily Allioideae, tribe Allieae, subtribe Alliinae.

Table 1 shows that there are reasonably close structural resemblances among *Allium, Caloscordum, Nothoscordum, Tristagma,* and *Tulbaghia.* There are biochemical differences in the stainability of the laticifer contents and the presence or absence of starch. It is interesting to note that although *Nothoscordum bivalve* (Saghir, et al., 1966) and *Tulbaghia fragrans* are non-odorous, the leek-like odor of *T. violacea* is quite apparent (Menz, 1910; Jacobsen, et al., 1968). Wilsenach (1967) has found the basic chromosome number to be 6 in *Tulbaghia.* This may be contrasted with the basic number of 7, 8, 9 and 10 in *Allium* (Traub, 1968).

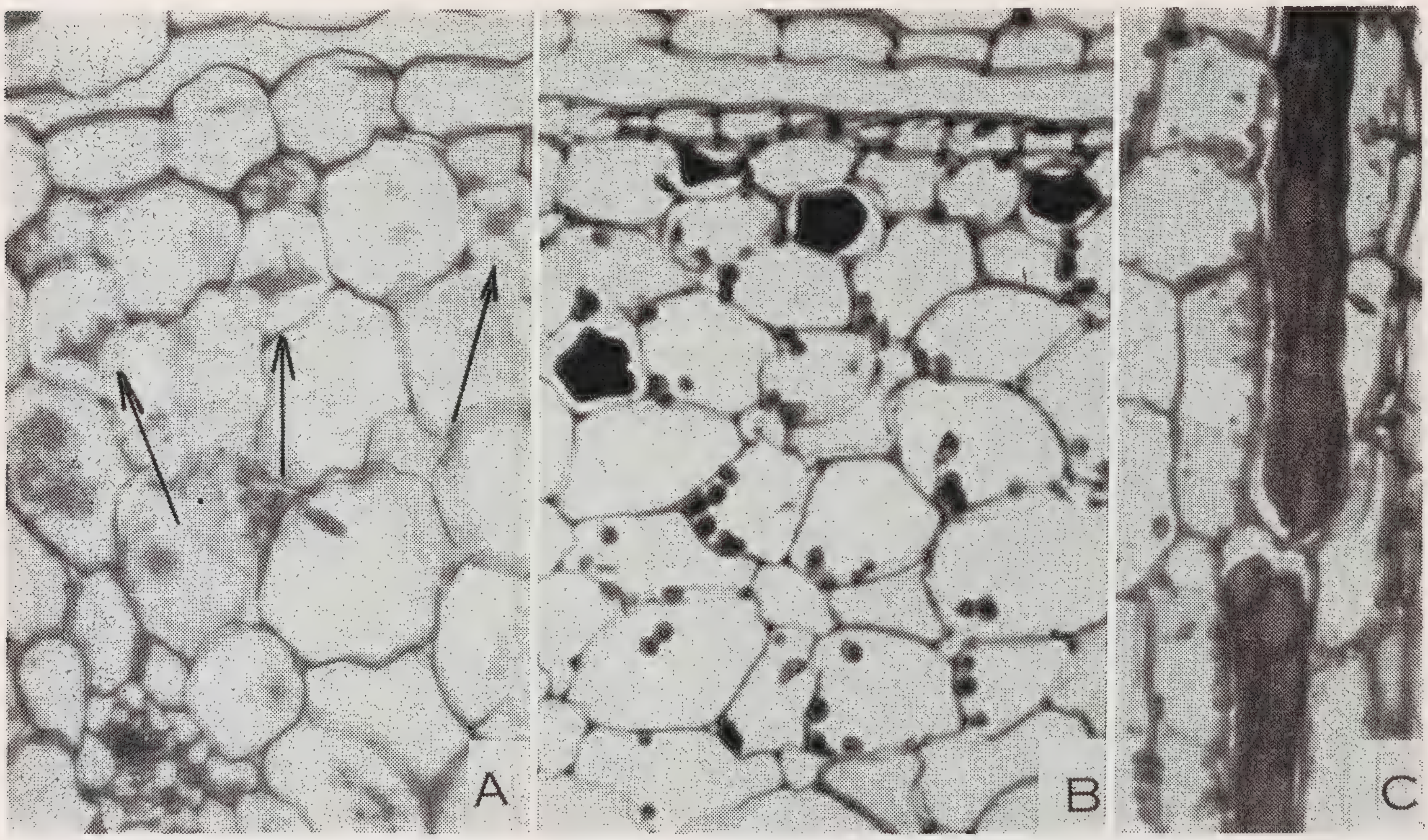

Fig. 14-A. Cross-section of bulb scale of **Caloscordum neriniflorum** showing laticifers at arrows, x306. Fig. 14-B. Cross-section of bulb scale of **Tulbaghia fragrans.** Note deeply-staining contents of laticifers. Parenchyma cells contain starch grains. x200. Fig. 14-C. Tangential section of bulb scale of **T. fragrans.** x200.

In conclusion, it may be stated that although there are apparent biochemical differences of greater or lesser degree among the 5 genera considered here, there are strong structural similarities. The morphological evidence supports their close relationship.

LITERATURE CITED

Huang, S.-M. and Sterling, C. 1970. Laticifers in the bulb scales of **Allium.** Amer. J. Bot. 57:1000-1003.

Hutchinson, J. 1934. The Families of Flowering Plants. II. Monocotyledons. Macmillan & Co., Ltd. London.

Jacobsen, J. V., M. Yamaguchi, L. K. Mann, F. D. Howard, and R. A. Bernhard. 1968. An alkyl-cysteine sulfoxide lyase in **Tulbaghia violacea** and its relation to other alliinase-like enzymes. Phytochem. 7:1099-1108.

Krause, K. 1930. Liliaceae. Natürl. Pflanzenfam. 2nd Ed. 15a. W. Englemann. Leipzig.

Lindley, J. 1853. The Vegetable Kingdom. 3rd Ed. Bradbury & Evans. London.

Menz, J. 1910. Beiträge zur vergleichenden Anatomie der Gattung **Al-**

lium nebst einigen Bemerkungen über die anatomischen Beziehungen zwischen Allioideae und Amaryllidoideae. Sitzber. K. Akad. Wiss. Wien. Math.-naturw. Kl. 119(1):475-533.

Saghir, A. R. B. 1964. Volatiles in **Allium.** Ph.D. diss. Univ. of Calif. at Davis.

Saghir, A. R. B., L. K. Mann, M. Ownbey, and R. Y. Berg. 1966. Composition of volatiles in relation to taxonomy of American Alliums. Amer. J. Bot. 53:477-484.

Traub, H. P. 1963. The Genera of Amaryllidaceae. Amer. Plant Life Soc. La Jolla, Calif.

Traub, H. P. 1968. The subgenera, sections and subsections of **Allium** L. Plant Life 24:147-163, 146.

Wilsenach, R. 1967. On the karyology and phylogeny of **Tulbaghia** Plant Life 23: 75-83.

PAMIANTHE CARDENASII SP. NOV.

Hamilton P. Traub

Up to the present, the Genus *Pamianthe* Stapf has been regarded as monotypic, with only the single species, *P. peruviana* Stapf, a terrestrial species from north central Peru, but now a second species, from Bolivia, has to be referred to this genus on the basis of the many ovules, in piles, in the elongated ovary. It is a truly epiphytic species, one of the few in this class in the *Amaryllidaceae.* The new species is appropriately named in honor of the Dean of South American plant scientists, Dr. Martin Cardenas of Cochabamba, Bolivia, who brought this plant to our attention.

Pamianthe cardenasii Traub, **sp. nov.** Fig. 15.

Planta epiphytica; rhizomate cylindrico 8 cm. longo, 2.5 cm. lato; bulbo 2—3 cm. longo, 3—6 cm. diametro, per rhizoma sustento, collo 15—20 cm. longo, 3—4 mm. lato; radicibus 12—20 cm. longis, 3—4 mm. latis; foliis numerosis, 40—60 cm. longis lanceolatis usque ad apicem acutissimum angustatis, costa alba prominenti; scapo 6—8 cm. longo complanato; umbella biflora; pedicellis 2—2.5 cm. longis; ovario 3 cm. longo; tubo tepalorum curvato 8—12 cm. longo, segmentis tepalorum 6—7 cm. longis; cupula staminorum 6—7 cm. longa; staminibus incurvatis 1.5—2 cm. longis; stylo 8 cm. longo, stigmate trilobato.

Holotypus: Bolivia, M. Cardenas s. n., No. 1018(TRA), Aug. 1970, Prop. Chapare, Dept. of Cochabamba, near The Rio Kellu Mayu, at Km. 105.

Plant epiphytic, bulbous, with roots 12—20 cm. long, 3—4 mm. in diam., intermingled in a soft cushion of decaying remains of various other epiphytic plants, up to 28 meters high in trees. *Rhizome* 8 cm. long, 2.5 cm. in diam., supporting the rather small *bulb,* 2—3 cm. long, 3—6 cm. in diam., bulb neck 15—25 cm. long. *Leaves* numerous, lanceolate, with a prominent white mid-rib, 40—60 cm. long, 3—4 cm. wide, much narrowed toward the very pointed apex. *Scape* 6—8 cm. long, flattened, 1.5—2.5 cm. in diam. *Umbel* 2-flowered, flowers pleasingly fragrant. *Pedicels* trigonous, 2—2.5 cm. long, green. *Ovary* hexagonous, 3 cm. long, 3 mm. in diam., green, ovules many, in piles, compressed. *Perigone* white, regular, tepaltube 8—12 cm. long, 6 mm. in diam., tepalsegs 6—9.5 cm. long, outer turning yellowish; staminal cup 6—7 cm. long, white. *Stamens* incurved, 1.5—2 cm. long; anthers 4 mm. long, yellow. *Style* 8 cm. long, greenish at the base, yellow above, stigma shortly trilobate, hairy.

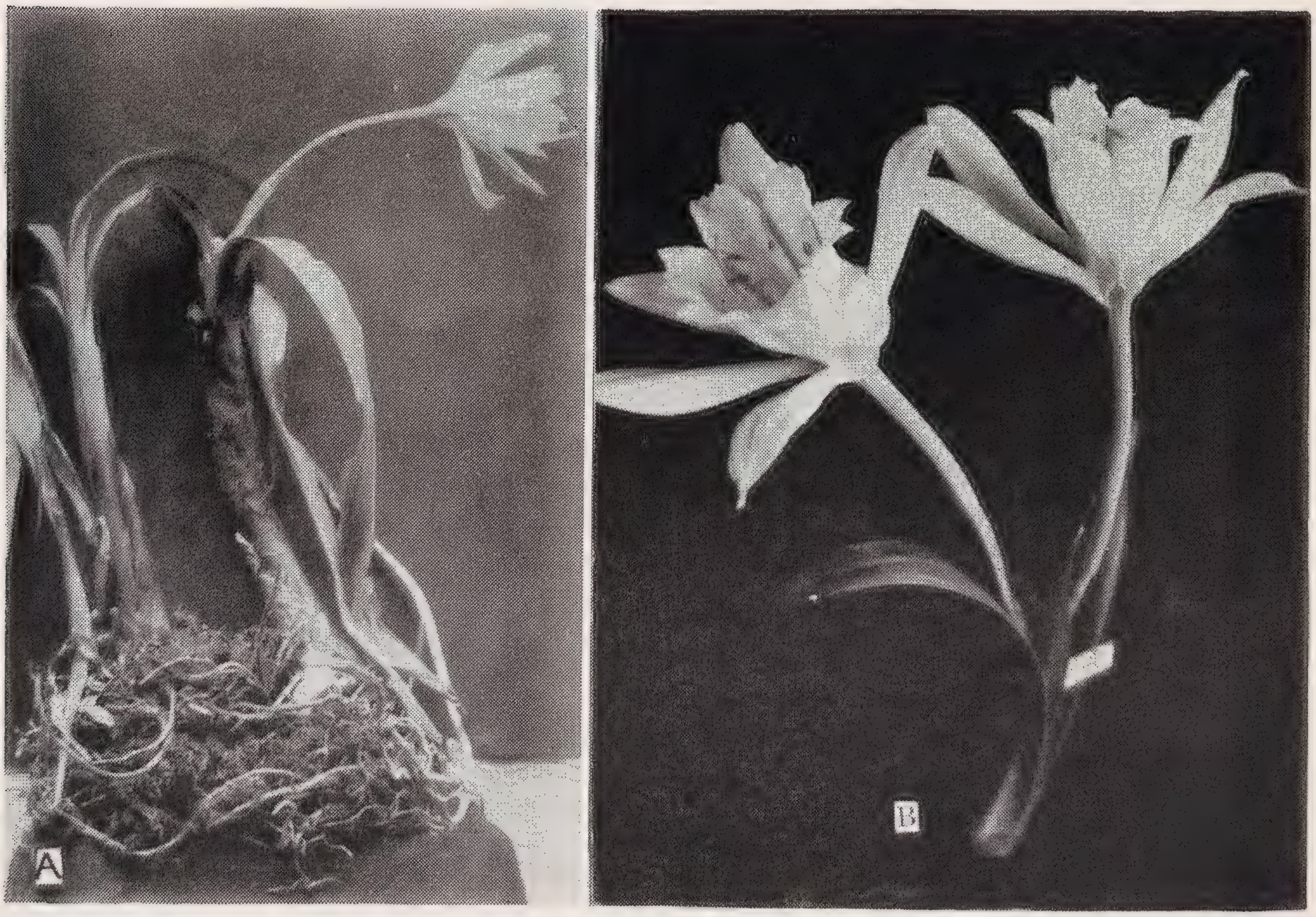

Fig. 15. **Pamianthe cardenasii** Traub, sp. nov., an epiphyte native to Bolivia. Photos by Dr. Martin Cardenas.

Range.— Known only from the type locality.

Notes.— Dr. Cardenas writes: This most interesting plant was sent to me a year ago (in 1970) by two students as an incomplete specimen. On August 4, 1971, several plants were collected for me by forest cutters of the Bartos Co., a highway building enterprise. The engineer, Sr. Jaime Rios C., sent me two complete plants, one in flower on August 10, 1971. Superficially this plant looks like another *Hymenocallis.*

I decided to go to the habitat of these plants to take photographs of the plants in their native stands. The journey from Cochabamba on August 10 was very hard indeed. They borrowed for me a camioneta, unfortunately not a 4-wheeled outfit. We arrived at the place. I saw two trees with the Hymenocallis-like plants in bloom; more than 20 flowers were seen; but unfortunately they were inaccessible. The trees were at least 30 m. tall. However, I photographed them and came back pulled by a tractor in our camioneta for some 100 m. We arrived home finally at Cochabamba at 6 p.m.

I made this trip to the Province Chapare, near the Rio Kellu Mayu at Km. 105, about 1700 m. distant, accompanied by two assistants from the National Forest Division; from Km. 70 to Km. 105 the highway was under construction with large machinery. However, in spite of the tremendous difficulties from the interference of the machines, and the softness of the soil on a humid Andean slope, we arrived at the place where they had chopped down a big tree with the Hymenocallis-like plants in its branches days ago. I saw two giant trees, each measuring about 30 m. high. It was impossible to even guess the name of the tree species because they were not in flower. Near the top at about 28 m. from the ground, there were many Hymenocallis-like plants in flower which we could not reach.

The place was uninhabited, and the road builders were busy removing rocks and mud to level the newly opened highway. When I asked about these two giant trees which were filled at their tops with all kinds of epiphytes such as Polypodiaceae, mosses, Tillandsias, etc., the workers told me that they had to be cut down. This was saddening from the standpoint of the conservation of nature. It appears that the delightfully fragrant Hymenocallis-like plants reproduce rapidly by offsets once a seed lodges in a suitable place for germination since there were a large number of bulbs together with each main mother bulb.

NEW BOLIVIAN AMARYLLIS SPECIES

Martin Cardenas, *Cochabamba, Bolivia*

Bolivia is a generously gifted country with native species of *Amaryllis.* In our present day *Amaryllis* flora, we have 21 well defined species. Out of these, 17 are native to Bolivia only. The published species of our authorship, attain to 11. No other country in America has that number of published *Amaryllis* species. We have still large unexplored areas, where more novelties are expected. In the last year, we found three more new species and one apparently known but not correctly identified. Now, we shall start diagnosing these.

Amaryllis anzaldoi Cárd. **sp. nov.**

Bulbo aliquid complanato. Folis lanceolatis inferne angustatis. Scapo subcylindrico, inferne purpureis. Umbella 2 flora. Bracteis albidis. Floribus zygomorphibus 10 cm long, 11 cm latibus. Tubo 10-12 mm long. Tepali segmentis cremeus, margine undulatus. Fructo triglobuloso.

Patria: Bolivia. Provincia Cordillera. Departamento Santa Cruz, vicinis Camiri, 800 m. Species collectori, Ing. Agron. Francisco Anzaldo dicata.

Obs.—Species similis *A. evansiae.* Distinguo graciolier et uniformiter cremea flos coloribus.

Bulb globose 3-3.5 cm long, 4-4.5 cm thick covered by light brown tunics. Neck very short 2-3 cm long. *Leaves* not present at anthesis, 4-6, lanceolate, 24-37 cm long, 2.5-3.2 cm wide, narrowing below. *Scape* 27 cm long, subcylindric 10 mm thick at base, light green above, purplish at base. *Umbel* 2 flowered. Flowers zygomorphic as in *A. belladonna,* 10 cm long, 11 cm diam. *Spathe-valves* whitish, turning brown at its tips, lanceolate 3-4 cm long. *Pedicels* 5 cm long slender, 4 mm thick. *Ovary* fresh green, 8 mm long, 5-6 mm thick. *Tepaltube* 10-12 mm long, green outside. *Setepalsegments* lanceolate 9x2.5 cm white, creamy with a green keel without, mucronate and waved at edges. *Petepalsegments* narrower, 8x2 cm; the lowermost 8x1.5 cm, curved. All petepalsegments of the same colour as the setepalsegments. *Paraperigone* formed by scattered dark green emergencies. *Stamens* grouped on the lower petepalsegments, curved above; filaments white, greenish below, 3.5 cm long; anthers when dehiscent, 4 mm long. *Style* 4.5 cm long, curved white, greenish below. Stigma trilobate, white. Fruit trilocular 1.4 cm high, 2.5 cm broad with globular locules.

Bolivia: Province of Cordillera. Department of Santa Cruz. Yatibigua Canion, on the way from Charagua to Camiri, 800 m. No. 2863. May 1934. M. Cárdenas (Type in Herbarium Cardenasianum).

Obs.—This species was collected by me during the Bolivia-Paraguay War when I belonged to the Sanitary Corps of the Bolivian Army and when I was not yet aware of the Amaryllidaceae. A duplicate specimen was sent in 1934 to the Field Museum of Chicago, where the late Dr. Paul C. Standley identified it as *Hippeastrum petiolatum* Pax, a name obviously wrong. This past year I received from my former pupil at the School of Agriculture in the University of ''San Simón'', Francisco Anzaldo, bulbs of this Amaryllis which flowered. The above description is based on these living plants. The species is named after Ing. Agron. F. Anzaldo. This species is related to *A. evansiae* from an other locality by its zygomorphic cream flowers. Differs however by its gracile appearance, its uniform colour of flowers which is green below and very light cream above. Flowers of *A. evansiae* are light purple or pink-tinged.

Amaryllis divijulianus Cárd. sp. nov.

Bulbo globoso. Pseudocollo longo. Folis apice acutia, basim angustatis. Bracteis purpureis. Tubo brevissimo. Umbela 2-3 flora. Perigonio perfecto regularibus. Segmentis coccineis cum stella viridis. Fructo ignoto.

Patria: Bolivia: Provincia Chapare. Departamento Cochabamba, prope San Julian, in vicinis Tablas, 1,800 m.

Obs.—Species reminiscer *A. leopoldii* et *A. lapacensis,* tamen distinguo segmenti coloribus.

Bulb 7-8 cm long, 6 cm broad. Neck 10 cm long. *Leaves* lorate acute at tips, narrowing at base, dark green, 40-50 cm long, 4 cm wide at its middle length. *Scape* 28-33 cm long green above purplish below, 1-2 cm thick somewhat flattened below. *Spathe-valves* lanceolate 7-9 cm long, purplish. *Umbels* 2-3-flowered. *Pedicels* 6-7 cm long, light green. *Tube* only 5 mm long. *Perigone* regular 13 cm long, 16 cm wide. *Ovary* dark green 2 cm long trigonous. Setepalsegments lanceolate 11.5-12x3.5 cm dark green below with a green keel up to the tips, lateral sections vermilion red darker red streaked outside, vermilion red with a light green star with short or long rays inside. *Paraperigone* haired very light green. *Stamens* 6.5-7.5 cm long; filaments light green at base, light purple red above; anthers yellow 5 mm long. *Style* 10 cm long of the same colour with stamens. Stigma yellowish slightly trilobate.

Bolivia. Province of Chapare. Department of Cochabamba. Peñón de San Julian near Tablas, 1,800 m. M. Cárdenas, No. 6321, August 1970 (Type in Herbarium Cardenasianum).

Obs.—This species was brought from Peñón de San Julian by muleteer Amerindians and delivered to an Amerindian gardener in whose house several flowering plants were examined by the author. Later on, bulbs were collected from that locality, where it grows as a wild species. *A. fragrantissima* also. The flowers of this new taxon are the most regular we know and its vermilion red color, makes it a valuable germplasm source for breeders.

Amaryllis caupolicanensis Cárd. **sp. nov.** Fig. 17-A

Geophyta vigorosa. Folis striatis luxurians, atro viridis. Scapo longissimo. Umbela 2-3 flora. Bracteis diluto viridis. Perigonio zigomorpho 11-12 cm long. Segmentis extus viridibus, intus rubis flavo virgatis. Omnia segmenta apice albo lineata. Fructo conico aplanato, 4.5 cm lato.

Patria: Bolivia, Provincia Caupolican. Departamento La Paz, Prope hortus Apolo Coenobium, 1,400 m.

Geophyte, vigorous. *Bulbs* 7 cm long, 7.5 cm broad, green. *Leaves* about 12, lorate 52-58 cm long, 2.5-5 cm wide, fresh green, striate with darker parallel grooves. *Scape* 50-73 cm long, 2.5 cm thick at its base 1 cm thick above, glaucous, pruinose, flattened below, cylindric above. *Spathe-valves* 6-7 cm. light green, brownish when drying. Bracteoles filiform 5 cm long. *Umbel* 2-3-flowered. *Pedicels* 4.5 cm long fresh green, darker above. *Ovary* 2 cm long, hexagonous, dark green. *Perigone* 11-12 cm long. 12 cm wide. Setepalsegments lanceolate 10x3 cm acute, greenish outside, red inside with yellow bars and stripes. Petepalsegments lanceolate, acute of the same colour as the setepalsegments. All segments white striped at the edges. Tube short, 8 mm long, dark green. *Paraperigone* light green. *Stamens* 10 cm long curved upwards, yellow greenish below, light red above. Anthers 5 mm long. *Style* 11 cm long, light green, yellowish below, purplish above. *Stigma* trilobate dark lilac-pur-

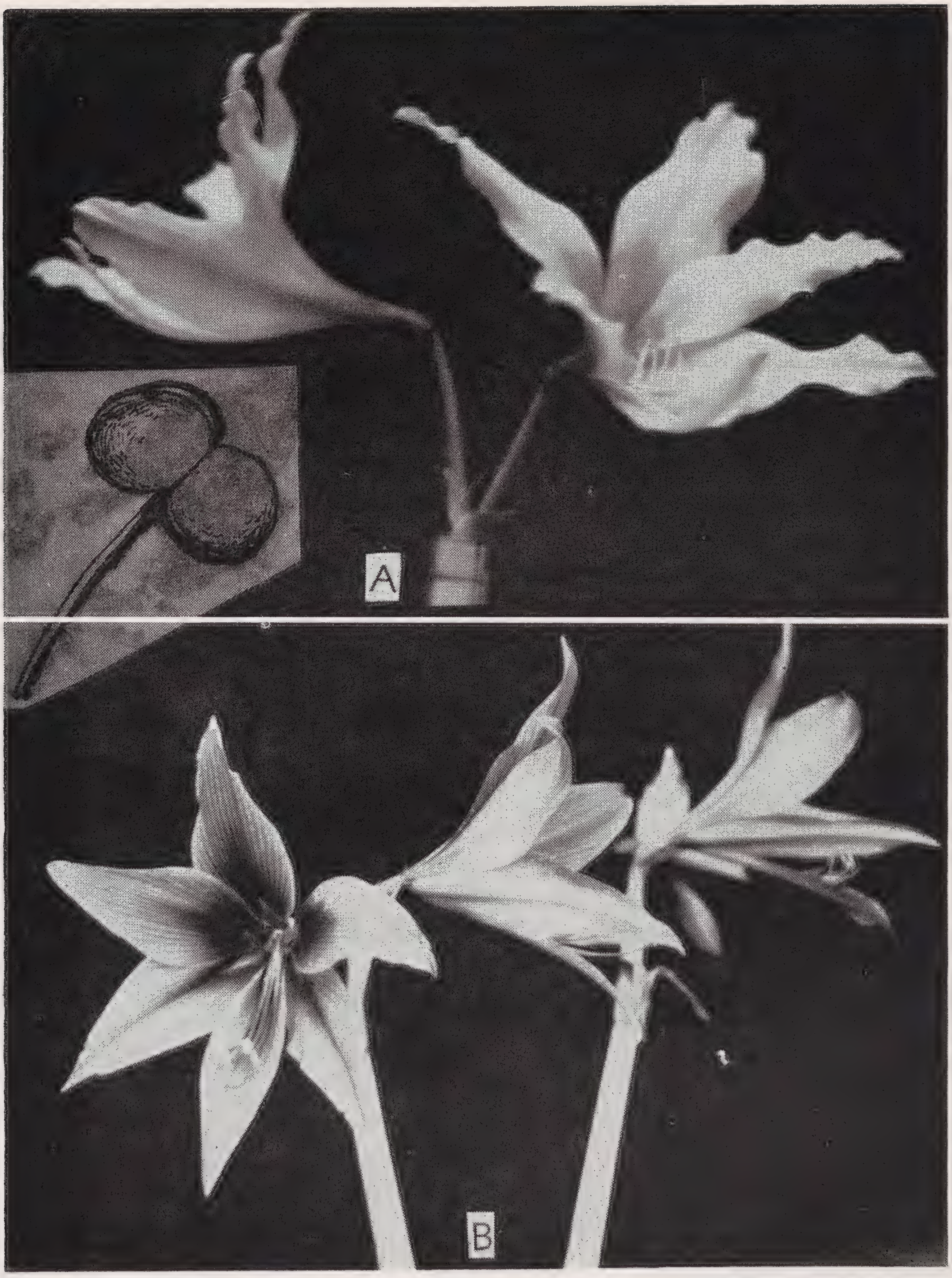

Fig. 16. **A, Amaryllis anzaldoi** Cardenas **sp. nov.; B, Amaryllis divijulianus** Cardenas, **sp. nov.** Photos by Dr. Martin Cardenas.

ple. *Fruit* flattened conic 2.2 cm high, 4.5 cm wide.

Bolivia. Province of Caupolican. Department of La Paz. Growing at the Convent of Apolo, 1,400 m. M. Cárdenas, August 1971, No. 3623 (Type in Herbarium Cardenasianum).

Obs.—This vigorous plant with peculiar leaves and flowers was growing at the Apolo Convent garden. It was brought from the wild, probably from nearby Huarutumo River by a native Amerindian.

Amaryllis neoleopoldii Cárd. sp. nov.

Bulbo globoso 7 cm diam. Scapo subtereto. Umbella 2 flora. Bracteis flavo viridiscentibus. Floribus superbus 14 cm long. 15-18 cm latibus. Tepalsegmentis rhomboide-ellipticis 11-12 cm long. 5 cm latis extus cremea viridiscentibus, intus sanguineo rubis, margine albidis.

Patria: Bolivia. Provincia Caupolican. Departamento La Paz, vicinis Fluvis Tumo, 1,200 m.

Obs.—Species valde similiter vel ejusdem *Amaryllis leopoldii,* jam pridem deperdo.

Bulb globose 7 cm diam. Neck short, 5 cm long. *Scape* 20 cm long, subterete 18 mm thick at base, two ribed, tapering. *Umbel* 2-flowered. *Spathe-valves* lanceolate 8 cm long, straw yellow greenish. *Pedicels* 3-3.5 cm long dark green. Flowers 14 cm long, 15-18 cm wide. *Ovary* 2 cm long, trigonous, dark green. *Perigone* the most regular known among Amaryllis species. Tepaltube very short, 5 mm long. Tepalsegments rhomboid-elliptic 11-12 cm long, 5 cm wide except the lower tepalseg which is only 3.5 cm wide. The tepals are cream light greenish, green at base outside, solid red at the longitudinal middle section inside, fading laterally to red stripes and dots. The borders are white cream. All tepals very finely picotee. Floral throat greenish with bifid and trifid lighter bars at the base of each tepal. *Paraperigone* white greenish, hairy. *Stamens* curved upward, uneven 6-7 cm long; filaments light green at base, white at its middle section, purple above; anthers yellow 7-8 mm long when shedding pollen. *Style* slightly longer than stamens and of the same colour. Stigma remotely trilobate, purple.

Bolivia. Province of Caupolican. Department of La Paz. Tumo River basin, 1,200 m.

Obs.—This superb species bears the most regular and showy flowers known up to now in the genus. This might be the plant discovered together with *A. pardina* by R. W. Pearce (sent to South America by the British nursery, Veitch & Son on his second journey). It is said that he sent to England in 1865 from Peru these two species. However, in spite of the extensive botanical explorations made in Perú, by Ruiz and Pavon, Raimondi, Weberbauer, Velarde, Ferreyra, Vargas and many others, neither of these two species were collected. It is to be presumed that Pearce purposely avoided giving the true locality of his extraordinary discovery in order to hide it from others.

As there is not a type specimen of *Amaryllis leopoldii* nor a colour illustration published, we are diagnosing it as a different species. Our

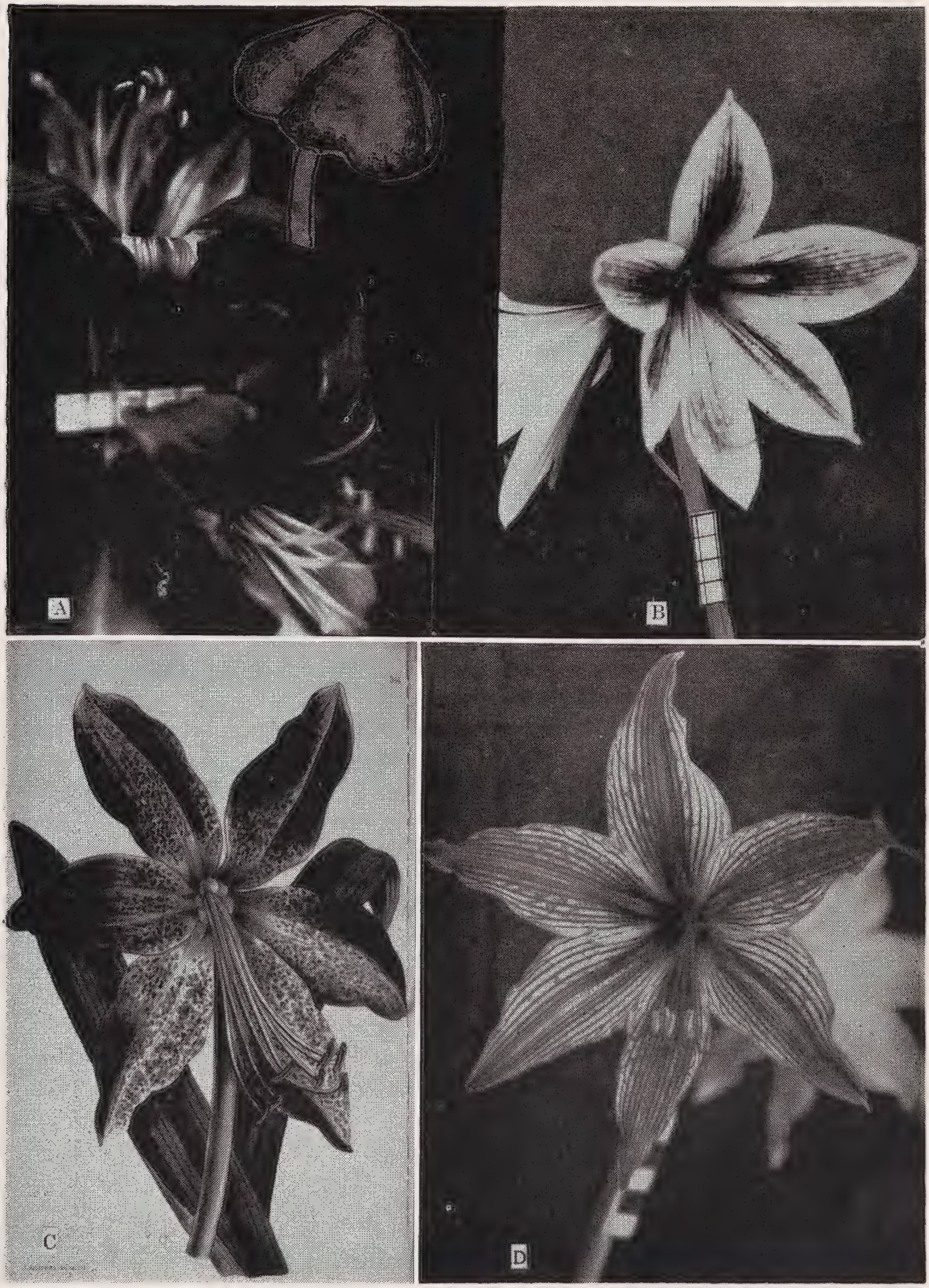

Fig. 17. **A, Amaryllis caupolicanensis** Cardenas, **sp. nov.; B, Amaryllis neoleopoldii** Cardenas, **sp. nov.; C, Amaryllis pardina** Hook f. (from color plate in Floral Magazine 6: plate 344.); and **D, Amaryllis neopardina** Cardenas, **nom. nov.**

Amaryllis pseudopardina, published in Plant Life (1965) seemed close to the lost species of Pearce. However, *A. neoleopoldii*, differs from *A. pseudopardina*, by its much larger flowers, wider tepals, longer ovary, colour of floral parts and its geographical origin.

Amaryllis lapacensis Cárd. sp. nov.

Geophyta. Bulbo globoso. Folis espatho-lanceolatis. Umbela 2 flora. Bracteis diluto bruneis. Floribus regularis actinomorphis. Segmentis lanceolatis albidis intus rubro lineatis.

Patria: Bolivia. Provincia Sud Yungas. Departamento La Paz, prope Hacienda Chocana 1,700 m.

Obs.—Species *A. leopoldii* similis. Differe manifestus tepali rubrolineata et non a basim solido coloribus.

Geophyte. *Bulbs* globous, covered by brown scales, 3-7 cm long, 5-7 cm thick, somewhat flattened at base. *Leaves* spathulo-lanceolate 30-60 cm long, 3-4 cm wide, slightly grooved, acute. *Scape* 30-60 cm long, 1-2 cm thick at base, whitish below, green above. *Spathe-valves* lanceolate 5 cm long brownish at anthesis. Bractlets whitish 4 cm long. *Umbel* two-flowered. *Pedicels* 3.5-4 cm long, 5 mm thick, green. Flowers actinomorphic. *Ovary* obconic 1 cm long, dark green, trigonous. *Perigone:* tube short, 3mm long. Setepalsegments lanceolate 10x3.7 cm. Petepalsegments lanceolate 9.5x3-3.5 cm. All segments white, green at base with a green keel fading in colour toward tips, outside white greenish at base and crimson streaked inside. *Paraperigone* hairy, white. *Stamens* 5.5 cm long; filaments light green at base, white at its middle section and light purple above. Anthers 4 mm long, yellow above, dark gray beneath. *Style* longer than stamens, 9.5 cm long of the same colour as stamens. Stigma trilobed, dark purple.

Bolivia. Province of Sud Yungas. Department of La Paz. Hacienda Chocana, near Puente Villa 1,700 m. July 1958. M. Cárdenas No. 6325 (Type in Herbarium Cardenasianum).

Obs.—We collected this taxon for the first time at the above mentioned locality in July, 1958. Professor Nelson found this same species at Santa Cruz, Bolivia, 550 m. in 1954 and identified it as *Amaryllis pardina* Hook. f. When we collected flowering material in July 1958 and bulbs in November of the same year at Chocana, we followed Prof. Nelson in his identification. Later on, we have read the original description of *H. pardinum* with a colour illustration in Floral Magazine 6: Plate 344 and came to the conclusion that we were wrong identifying our Hacienda Chocana plant which has crimson *striped* tepals. In the description of *Hippeastrum pardinum*, we read: ''The marking of the flowers is also very peculiar, *not striped* (non vittata) and dashed''. The true *H. pardinum* was probably collected by Pearce not in Peru, but in the Apolo area in Bolivia, where we have seen it. On the other hand what was passing as *A. pardina*, is a new species. There are in Bolivia three related species: one closely related to *A. leopoldii*, lastly collected by one of our assistants at the Apolo district, *A. pseudopardina* Cárd. from Yungas de Corani, Chapare, Cochabamba and the present new species, *A. lapacensis.* To make clear this taxonomic situation we shall substitute the name *A. pseudopardina* for *A. pseudoleopoldi* (Cárd.) nom. nov. The more closely resembling *A. leopoldii* of our last year's collection, should be named *A. neoleopoldii* Cárd.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Ugernia flava Boiss. & Hausskn. in Boiss. Fl. Or. 5: 149. 1882; Wendelbo, Amaryll. in Rechinger, Fl. Iranica No. 67/3. 1. p. 4. 1970.

Bulb large, the tunics shiny, purple-black, prolonged into a long neck; leaves vernal, marcescent at time of flowering, about 20 cm. long and 1.5-2 cm. wide, flexuous; scape 10—25 cm. long; spathe valves up to 7 cm. long; umbels 5—10-flowered; pedicels unequal, 1.5—5 cm. long; perigonium becoming yellowish, with a rose-colored median band, the tube about 6 mm. long, the segments about 22 mm. long and 4 mm wide. It flowers from July to August.

Hemerocallis darrowiana Shiu-ying Hu, Hemerocallis Journal 23(4): 42, Fig. p. 43. 1969 (1970).

Low perennial herb, 10—14 cm. tall; exterior leaves plicate and recurved, the interior ones linear or ensiform, 5—8 cm. long, 2—8 mm. wide; peduncle very short; pedicels 1—4 cm. long; flowers 2, the perianth 6 cm. long (the tube 2 cm. long, the segments 4 cm. long); capsule unknown.

FAMATINA GEN. NOV., AMARYLLIDACEAE

PEDRO FELIX RAVENNA, *Departamento de Biologia,*
Facultad de Ciencias, Universidad de Chile

Since 1961, the discovery of an interesting plant in the mountains of Catamarca (Argentina), suggested the presence of an undescribed genus. At that time, when examining the flower, my attention was attracted by the peculiar placement of stamens and style, which resulted in an inverted zygomorphism. This kind of structure did not fit the usual flower types in the family. In fact, although resembling a *Rhodophiala,* the flower had much of the aspect of a *Gladiolus,* or more precisely of a *Homoglossum.*

During the necessary inquiries, a close affinity between this and *Phycella herbertiana* was found. Therefore, it was provisionally considered with some doubt, as pertaining to *Phycella.* Recently however, I had the opportunity to investigate, in their living condition, the flowers of two genuine *Phycella* species, such as *Ph. ignea* and *Ph. brevituba.* It then became clear that the critical plant above mentioned, along with the so called *Phycella herbertiana*, and another unnamed species, should belong to a natural group of generic rank. The distinctive structure and position of the different parts of the flower, including the perigone, androecium, paraperigone and style, are, in my opinion, solid arguments for proposing a new genus.

FAMATINA GEN. NOV. (TRIBE HABRANTHEAE)

Flores plus minusve zygomorphi. Perigonii tubus brevis. Tepala in duis tertiis inferioribus vel ultra convoluto-contiguis deinde oblique vel recurve patentia. Stamina fasciculata ascendentia vel subrecta; filamenta quadriseriata; antherae reniformes versatiles. Paraperigonium in annullo valde fimbriato-lacerato ad basin veram tepalorum situm reductum. Stylus filiformis ascendens prominens supra fasciculum staminorum situs; stigma capitatus. Capsula globoso-tricocca; semina complanata nigra ad margines membranacea.—Bulbus tunicatus. Folia lineria modice canaliculata serotina vel synanthia. Scapus fistulosus teres. Spatha bivalvata; valvae liberae vel ad basin leviter connatae subaequales.

Flowers more or less zygomorphic. Perigone tube short. Tepals convolute-contiguous for two thirds or more, spreading obliquely or recurved. Stamens fasciculate, ascending or almost straight; filaments of four different lengths; anthers reniform, versatile. Paraperigone reduced to a fimbriate-lacerate ring at the base of tepals. Style filiform, ascending, prominent, placed above the stamen fascicle; stigma capitate. Capsule globose-tricoccous; seeds flat, black, with membranous margins.—Rootstock a tunicated bulb. Leaves linear moderately channeled, serotine or present at flowering time. Scape hollow, cylindric. Spathe bivalved; valves almost equal, free or slightly connate at the base.—Type-species: *Famatina saxatilis* Rav.

Three species from the Andes of Argentina and Chile. *F. saxatilis* Rav., inhabits the mountains of Catamarca and La Rioja, in Northwestern Argentina; *F. herbertiana* (Lindl.) Rav., a native of San Juan and Mendoza (Arg.), and of the province of Aconcagua, near the border, in Chile; *F. maulensis* Rav. grows in Talca, in the latter country. The generic name commemorates the Famatina mountain system, in the province of La Rioja, where the type-species is found.

1a. Flowers ascending. 1. *F. saxatilis*

1b. Flowers horizontal to declined.
  2a. Perigone about 3 cm long, the stamens not protruding from it. 2. *F. maulensis*
  2b. Perigone 4.5—5.8 cm long, the stamens protruding from it. 3. *F. herbertiana*

1. *Famatina saxatilis sp. nov.*
(Fig. 18-B)

A *Famatina maulensi* et *herbertiana* floribus erecto-patentibus magis expansis scapo perbrevi differt.

Plant about 8.8-15 cm high. *Bulb* ovoid ca. 5 cm long, 3.5-4 cm in diameter, produced into a 8-9 cm long pseudo-neck, profusely covered with dark brown membranous coats. *Leaves* linear, a dark green, moderately channelled, absent at anthesis, to 20-40 cm long, 6-7 mm broad. *Scape* reddish about 1-6.8 cm long, 3.1-3.5 mm in transverse section. *Umbel* two-flowered; *Spathe-valves* narrowly lanceolate or linear-lanceolate, reddish, membranous, marcescent, connated for 2-3.5 mm, ca 33-51 mm long. *Pedicels* 8-27 mm long. *Flowers* ascending, bright red, about 3.8-4.2 cm long, 30-40 mm in diam. Tepals narrowly oblanceolate, connate for 5-6 mm, to 38 mm long, 5-7 mm broad, the inner often slightly narrower. *Stamens:* filiform, fascicled, shorter ca. 22-25 long,

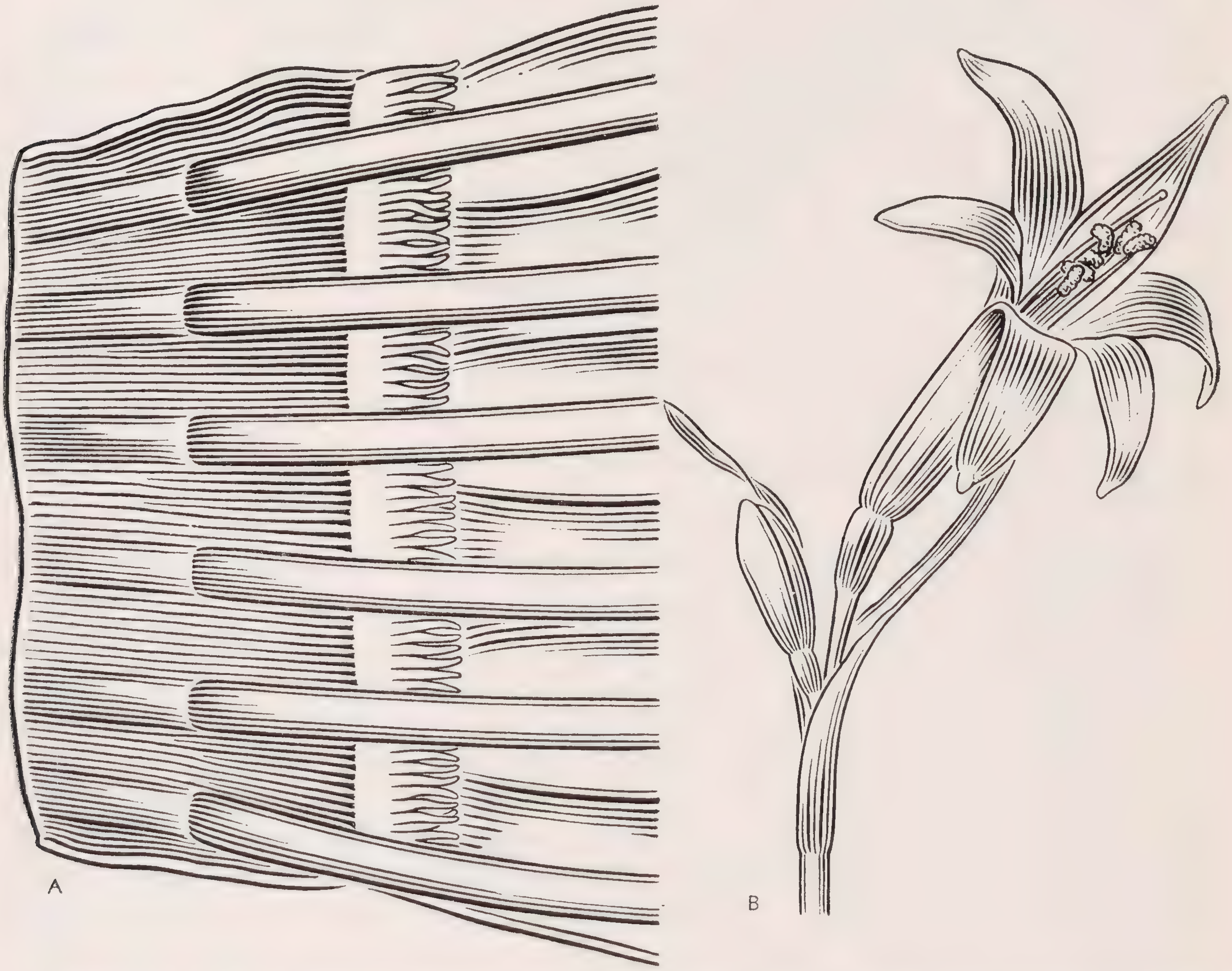

Fig. 18. **A, Famatina herbertiana** (Lindl.) Rav., detail of paraperigone and stamen insertian, x4.5; **B, Famatina saxatilis** Rav., inflorescence x0.6; P. F. Ravenna del.

longer pair to 31 mm long; anthers oblong-reniform, about 2.1-2.7 mm long; pollen yellow. *Ovary* obovoid, obtusely trigonous, a reddish brown, ca. 4.9-6 mm long, 3-3.2 mm broad. Style slightly curved, prominent, surpassing the stamens, to 36-40 mm long; stigma capitate, slightly trilobed.

Hab.—In a high valley called Pastos Largos, at 3500 m. over the sea level, above Fiambalá, in the province of Catamarca, Argentina; it grows among stones on arid, nude slopes, in the west side of the valley. It is also found on the Famatina mountain branch, of La Rioja (Arg.).

Specimens: In convalle Pastos Largos dicto provinciae Catamarcae Argentinae; leg. Ravenna 109, XII-1961 (typus in Herb. Ravennae). Prov. La Rioja, Sierra de Famatina, Cueva del Tocino; leg. A. Krapovickas & J. Hunziker 5379, 15-I-1949 (BAB).

This pretty plant is endemic in the high mountains of North La Rioja and South Catamarca, in Argentina. It is easily distinguishable from the rest of the species by the contrasting characters that appear in the key.

The flower shape much is reminiscent of *Homoglossum watsonium,* a South African Irid.

2. *Famatina maulensis sp. nov.*

(Fig. 19.)

A *Famatina saxatili* et *herbertiana* floribus parvis perangustis staminibus perigonio haud excedentibus recedit.

Plant about 34-36 cm high. *Bulb* ovoid ca. 32 mm long, 20-22 mm in diam., prolonged for 35-60 mm into a pseudo-neck; outer coats a dark brown. *Leaves* 3-4, present at anthesis, linear, somewhat fleshy, to 20-30 cm long, 2-3 mm broad. *Scape* cylindrical, reddish, ca. 30-32 cm long. *Umbel* two-flowered, reddish. *Spathe-valves* lanceolate, reddish, subequal, membranous, to 22-24 mm long, connate at the very base for 1.5 mm; inner bracts linear-lanceolate, whitish, about 10-17 mm long. *Pedicels* ca. 28-31 mm long. *Flowers* red, slightly curved, horizontal to declined, very narrow. *Ovary* narrowly ellyptic. *Perigone* about 30 mm long, 7-9 mm in diam. at the apex. Tepals connate for 4-4.5 mm then 25-25.5 mm long. Imbricate-contiguous for ¾ of its length, the upper fourth slightly spreading; outer series ca. 2.5 mm broad, apiculate; apiculum 0.7-0.8 mm long; inner series 2.6-2.8 mm broad. *Stamens* rather shorter than the perigone. *Paraperigone* very minute, less than 1 mm long, lacerate. *Style* 33-34 mm long; stigma capitate.

Hab.—Sandy places not far from the shores of the Laguna del Maule, in the province of Talca, Chile. It grows in the same places where also *Rhodophiala montana* (syn. *Rh. bakerii*) is found, but in this region the latter flowers much earlier.

Specimens: Chile, prov. of Talca, near Laguna del Maule; leg. Zoellner, XII-1969 (type in Herb. Ravenna, isotype Herb. Zoellner).

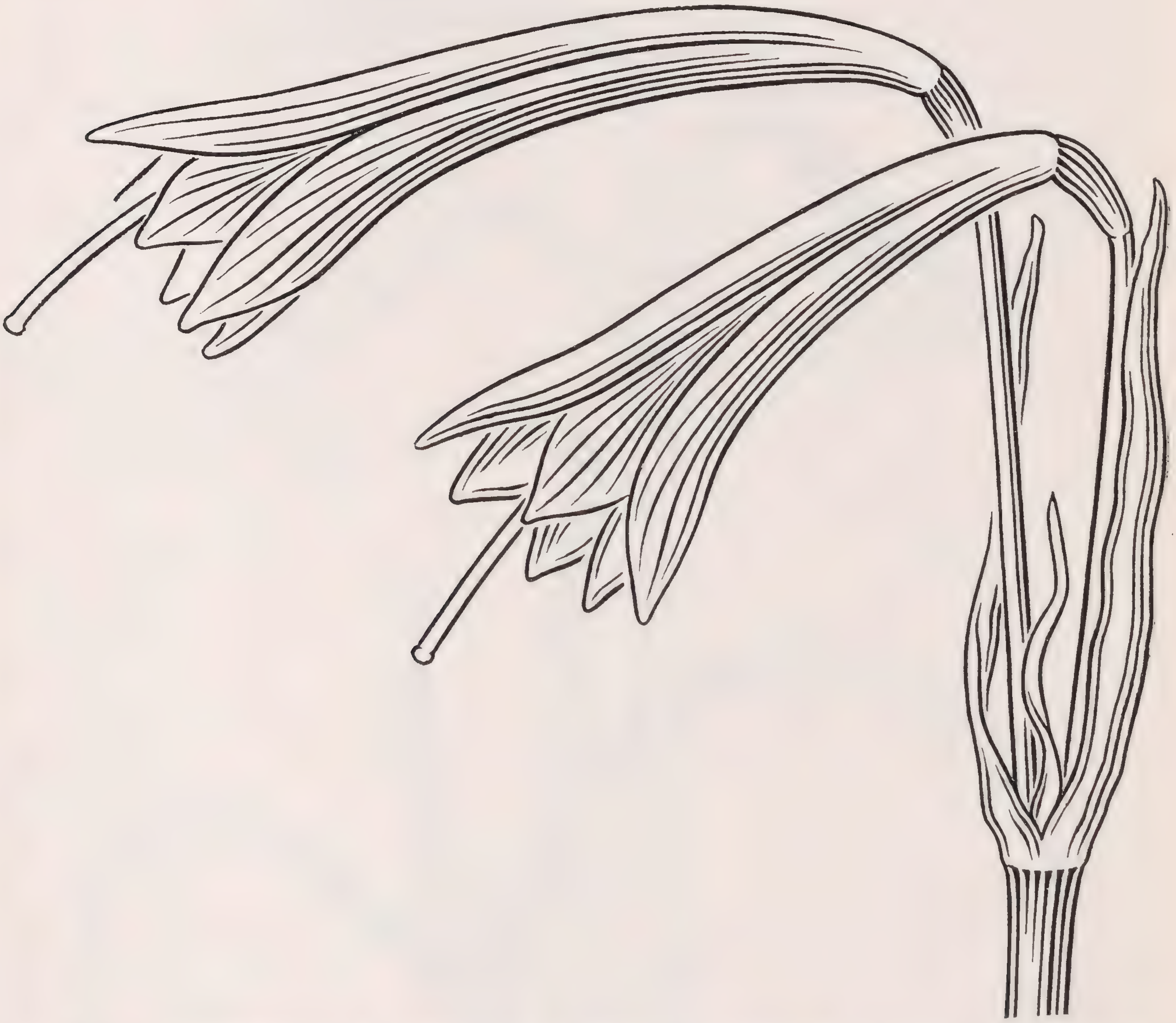

Fig. 19. **Famatina maulensis** Rav., inflorescence. P. F. Ravenna del x2.25.

Although related to *F. herbertiana* this small-flowered species cannot be mistaken for it. The very minute paraperigone and the stamens shorter than the perigone are distinctive features.

3. *Famatina herbertiana* (Lindl.) comb. nov.
(Figs. 18-A and 20.)

Phycella herbertiana Lindley, Edwards' Bot. Reg. 16: tab. 1341. 1830.—*Hippeastrum herbertiana* (Lindl.) Baker, Handb. Amaryll.: 45. 1888.—*Amaryllis herbertiana* (Lindl.) Traub et Uphof, Herbertia 5: 121. 1938.

Bulb ovoid or widely ovoid, about 39-60 mm long, 35-40 mm in diam., produced into a 8-19 cm long pseudo-neck, outer coats many, a dark brown, sphacelate. *Leaves* contemporaneous with the flowers or

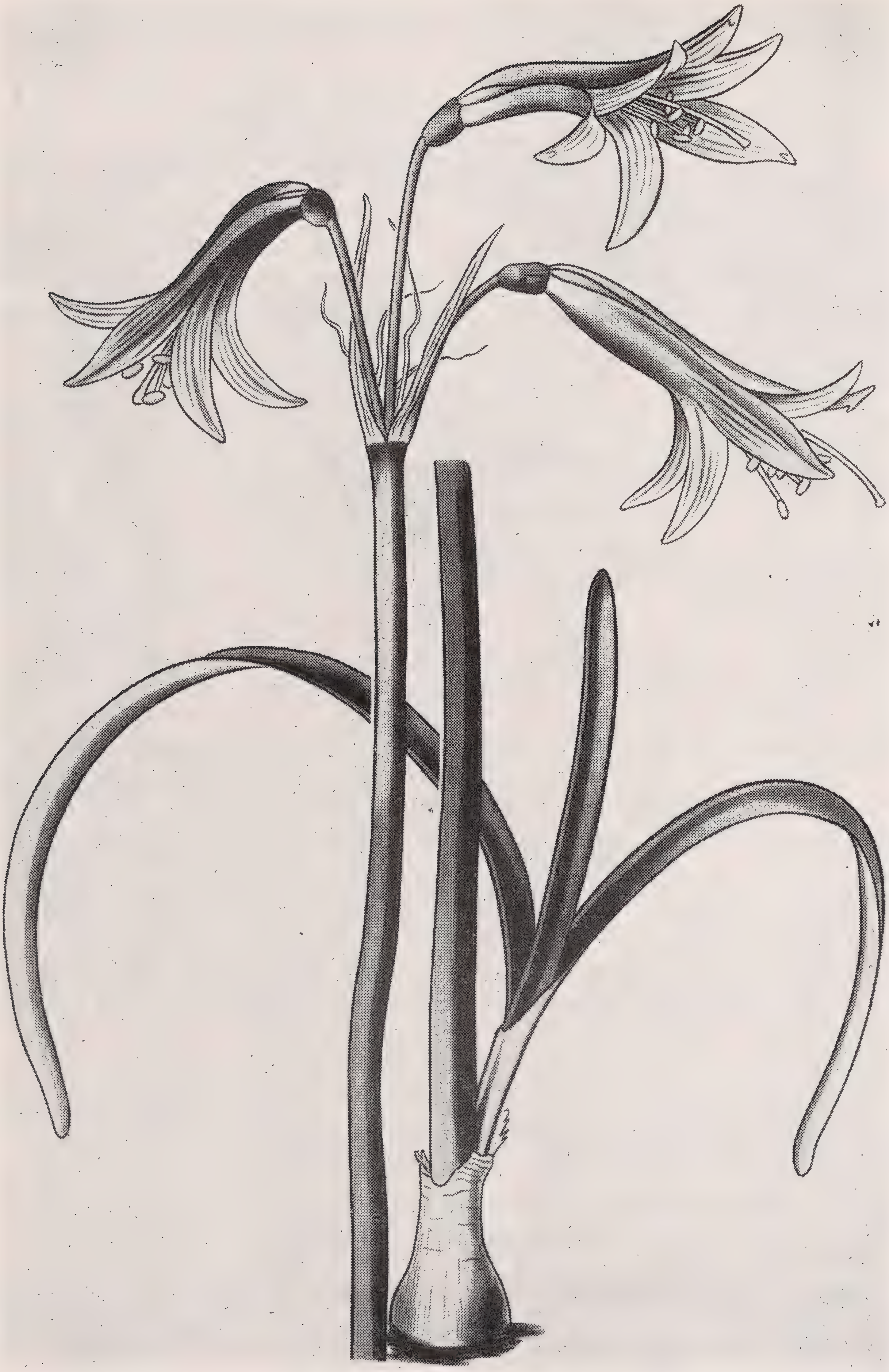

Fig. 20. **Famatina herbertiana** (Lindl.) Rav., reproduced from Bot. Reg. 16: tab. 1341, 1830. Retouched photo by P. F. Ravenna.

rarely serotine, linear, moderately channelled, somewhat fleshy, often prostrate and falcate, about the scape length, 6-13.5 mm broad. *Scape* subcylindrical, rufescent, ca. 10-28 cm long, 4-7 mm in transverse section. *Spathe-valves* membranous, marcescent, reddish, its valves subequal, lanceolate, often slightly connate at the base, about 34-64 mm long; inner bracts very thin, filiform, as much as flowers shorter than the pedicels. *Umbel* 3-6-flowered. *Pedicels* 14-40 mm long, becoming longer and stouter with fructification. *Flowers* fire-red or crimson, narrowly infundibulate, often somewhat curved (resembling the genus *Anigozanthos*), horizontal or declinate. *Ovary* obovoid, obtusely trigonous, a brown green, ca. 2.8-4 mm long, 1.5-1.8 mm broad. *Perigone* somewhat bilabiate, ca. 30-40 mm long, expanding 13-17 mm toward the apex. Perigone-tube ca. 2.5-3 mm. Tepals narrowly oblanceolate, permanently contiguous for 15-17 mm, then spreading moderately, to 28-30 mm long; outer series ca. 4.5-6.5 mm broad, apiculate; apiculum 1.2 mm long, densely glandular-pilose on the inner face; inner series slightly narrower, acute. *Stamens:* filaments filiform, inserted all at the same level on the inner half of the perigone tube, upper episepal ca. 16.8 mm long, lateral episepal about 20.7 mm long, lower epipetal to 26.2 mm long, lateral epipetal 28.5-28.8 mm long; anthers yellow, 2.8-2.9 mm long. *Paraperigone* annullar, whitish, lacerated for almost two thirds, placed at the base of segments. *Style* longer than the stamens, to 32-36 mm long, filiform, red in the upper fourth; stigma capitate. *Capsule* globose-tricoccous. Seeds compressed, subovate, black, with membranous margins.

Hab.—Andes of Mendoza and San Juan (Arg.), and in the province of Aconcagua, Chile.

Specimens: Argentina, Prov. of Mendoza, Tunuyán, Bella Vista; leg. G. Covas 18014, XII-1946 (SI). Idem, environs de Mendoza: (?); leg. Carette, XII-1906 (BA 36642). Idem, Precordillera de San Ignacio; leg. R. Sanzin 144 (BA 25/1871). Idem, Dept. Las Heras, Quebrada del Toro; leg. G. Covas 618, 5-XI-1942 (SI). Idem, between Villavicencio and Paramillo leg. J. Hunziker & A. Calantramé 3295, I-1948 (BAB). Idem, Villavicencio, Los Hornillos, 2850 m; leg. W. Partridge 21-XII-1963 (BA 59609). Idem, Paramillos de Uspallata; leg. Castellanos, 6-I-1941 (BA 36642). Idem, between Cajón de la Pampa and Cerro Bayo; leg. Bodenbender, X-1896 (BAF). Idem, in a valley between Villavicencio and Paramillo; leg. Gillies (photo from the type of *Phycella graciliflora* from K, Herb. Hooker). Prov. of San Juan, Paramillos; leg. Echegaray (photo 9975 from the type of *Habranthus gladioloides,* Field Mus. series). Chile, prov. of Aconcagua, Portillo; leg. Castellanos, 1-I-1938 (BA 23019). Idem, Portillo, side of Mendoza; leg. W. Díaz, 1861-62 (SGO 47170); Cumbre Andium Claustrum; leg. Macrae, 1825 (photo nr. 434 at SGO, the specimen det. *Habranthus phycelloides* Herb. at K).

From 1830, when Lindley described it, this plant had its origin misassigned. This author says: "A native of Cumbre, a mountain pass between Valparaíso and Santiago". The plant had passed, until our days, exclusively as Chilean, and its native area referred by successive authors, beginning by Baker, as ''Cordilleras de Santiago''. The latter designation was taken from the type-sheet of *Rhodophiala andina* Phil., a species treated by Baker as a synonym of *Hippeastrum herbertianum* (Lindl.) Bak. (=*Famatina herbertiana*), but which I consider as a distinct *Rhodophiala.*

One of the almost classic itineraries of the botanists and explorers of Chile in the last century, was the route eastwards, along the valley of the river Aconcagua, on the way of the high elevations of the Andes which finally reaches Mendoza. In his ''Reise in Chile . . .'', Poeppig gives a vivid narrative of his own experience (Chapter 4): ''Passing by El Portillo, a place where the porphiry walls approximate in such manner that they scarcely permit the mule to pass, I finally reached the upper part of the valley where I traveled from Santa Rosa downwards to the fertile fields of Aconcagua and Quillota. A stony and sterile slope extends, and when the fastidious and rugged path disappears to the eye, here is found the point near to the anxiously desired goal: La Cumbre, which is reached from here less than an hour later''. La Cumbre is the old name of the Uspallata pass, which is the access to the wide valley of Uspallata in the territory of Argentina. It is not a coincidence that the latter is the region where *Famatina herbertiana* is almost abundant. Portillo is apparently the only place in Chile where the plant is found.

The confusion probably originated during the introduction of the bulbs into cultivation. Some one could have interpreted the place where they had been gathered, as the higher point between Valparaiso and Santiago, which is also sometimes called Cumbre. Otherwise it is unquestionable that the species is not there.

The plant was reclassified by Herbert (1837) as *Phycella graciliflora,* on the basis of a specimen collected by Gillies in Mendoza; and by Hieronymus (1881) as *Habranthus gladioloides.* The type-specimen of the latter was gathered at Paramillos, in the province of San Juan; this place should be referred to the northernmost part of the high valley of Uspallata, in San Juan, which is also called ''Paramillos de Uspallata''.

Among the photographs of herbarium sheets deposited at the Museum of Santiago, there is one (nr. 434) which bears the following notation: ''Habranthus phycelloides—Cumbre Andium Claustrum; Macrae 1825 (Herb. Soc. Hort. Lond.)''. The specimen is identifiable as *Famatina herbertiana* (Lindl.) Rav. Therefore, it seems quite likely that Macrae had been the collector who first sent bulbs of this species to Great Britain. Plants in flower where described five years later, in 1830, by Lindley.

LITERATURE CITED

Baker, J. G., 1888, Handbook of the Amaryllideae, 216 pgs., London.
Herbert, W., 1837, Amaryllidaceae, 428 pgs., 48 pls., London.
Hieronymus, G., 1881, Bol. Acad. Cienc. Cordoba (Argentina) 4: 70.
Lindley, J., 1830, **Phycella herbertiana,** Edwards' Bot. Reg. 16: tab. 1341.
Pöppig, E., 1835, Reise in Chile, Peru und auf dem Amazonenstrome wärend der Jahre 1827-1832, 2 vls., Leipzig 1835-1836.

ALLIUM SPECIES AND VARIETIES *

Allium membranaceum Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1371. 1959, *anglice.* Indumentis interioribus bulbi reticulis quadratis per lineas verticalia arcte sinuosas ornatis; foliis 2 complanatis scapum aequantibus; scapo complanato 1.5—3.5 dm. alto; umbella 15—35-flora; floribus albidis usque ad rubellis; staminibus tepalis dimidio brevioribus; stigmate capitato; cristis capsulae 6 brevibus triangularibus. CALIFORNIA. BUTTE CO.: just east of Brush Creek Ranger Station, S. 8, T. 21 N., R. 6 E., June 25, 1946, *M. & G. B. Ownbey 2945* (WS, *Type*).

Allium siskiyouense Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1372. 1959, *anglice.* Indumentis interioribus bulbi sine reticulis definitis; foliis 2 subfalcatis 2—3 mm. latis; scapo 3—7 cm. alto leviter compresso; umbella 10—20-flora; floribus roseis, costa atrorosea; staminibus tepalis 1/3 brevioribus; capsulis tricristatis, cristis integris centralibus. OREGON. JACKSON CO.: grown at Pullman, Washington, from bulbs of *Ownbey & Preece 3336,* from Siskiyou Mts., 1.0 miles south of summit, *Type* (WS).

Allium hoffmanii Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1374. 1959, *anglice.* Indumentis exterioribus bulbi sine reticulis definitis; folio singulo complanato 4—8 mm. lato scapum superanti; scapo 5—10 cm. alto; umbella 10—40-flora; floribus purpureo-rubellis, costis viridibus; cristis capsulae 6 demissis. CALIFORNIA. Type, *F. W. Hoffman 2890* (WS), on serpentine, at a small lake, north side of Red Lassic, headwaters of Little and Big Van Duzen Rivers, 5,500 ft. alt., near the boundary line between Humboldt and Trinity counties, July 14, 1949.

Allium sanbornii var. *jepsonii* Ownbey & Aase, *var. nov.; Allium sanbornii* var. *jepsonii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1375. 1959, *anglice.* Foliis scapum subaequantibus; tepalis 7—8 mm. longis; staminibus bene inclusis; stigmate distincte trifido. CALIFORNIA. TUOLUMNE CO.: Table Mountain, above Rawhide, 2000 ft. alt., May 23, 30, 1919, *Mrs. W. J. Williamson 157* (CAS, DS *TYPE,* POM, RM, UC, US, WS).

Allium sanbornii var. *tuolumnense* Ownbey & Aase, *var. nov.; Allium sanbornii* var. *tuolumnense* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1375. 1959, *anglice.* Foliis scapo brevioribus; tepalis 6—8 mm. longis; staminibus perigonio quarta pars brevioribus; stigmate trifido. CALIFORNIA. TUOLUMNE CO.: canyon of Spring Gulch on Rawhide Hill, 1200 ft. alt., May 12, 1919, *Mrs. W. J. Williamson 64* (DS *TYPE,* UC, US, WS).

Allium howellii var. *clokeyi* Ownbey & Aase, *var. nov.; Allium howellii* var. *clokeyi* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice.* Scapo 1.5—3 dm. alto crasso; staminibus perigonium subaequantibus. CALIFORNIA. VENTURA CO.: Lockwood Valley, 1500 m. alt., May 22, 1935, *I. W. Clokey & E. G. Anderson 6554* (CAS, MO, NEB, NY, POM, UC *TYPE*, US, UTC, WS).

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* **Editorial Note.—These taxa were invalidly published. Dr. Marion Ownbey has kindly furnished the holotype citations which makes it possible to validate the names of the taxa.—Hamilton P. Traub**

Allium fimbriatum var. *munzii* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *munzii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1377. 1959, *anglice.* Scapo 1—2.5 dm. alto; tepalis rubellis 7—9 mm. longis; cristis ca. 1 mm. altis triangulari-lanceolatis integris vel grosse dentatis. CALIFORNIA. RIVERSIDE CO.: 3 miles s. of Glen Ivy, Apr. 29, 1922, *P. A. Munz 5051* (DS, POM *TYPE*).

Allium fimbriatum var. *sharsmithae* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *sharsmithae* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1377. 1959, *anglice.* Scapo 5—10 cm. alto foliis dimidio breviore; tepalis 10—15 mm. longis roseo-rubellis; cristis integris vel subintegris. CALIFORNIA. STANISLAUS CO.: near head of Arroyo del Puerto, Red Mts., 1300 ft. alt., May 19, 1935, *H. K. Sharsmith 3143* (WS *TYPE*).

Allium fimbriatum var. *diabolense* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *diabolense* Ownbey & Aase, in Munz & Keck, Calif. Flora. p. 1377. 1959, *anglice.* Scapo 7—25 cm. alto; foliis scapum aequantibus vel duplo longis; tepalis 7—9 mm. longis; cristis grosse dentato-laciniatis. CALIFORNIA. STANISLAUS CO.: near head of Arroyo del Puerto, Red Mts., Mt. Hamilton Range, 1750 ft. alt., May 18, 1935, *H. K. Sharsmith 3117* (WS *TYPE*).

Allium fimbriatum var. *denticulatum* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *denticulatum* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice.* Tepalis interioribus minute denticulatis; cristis integris vel dentatis. CALIFORNIA. KERN CO.: sandy open flats, 9 mi. n. of Ricardo, May 5, 1932, *P. A. Munz 12461* (MO, POM *TYPE*, UC).

Allium fimbriatum var. *abramsii* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *abramsii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice.* Squamis bulbi interioribus albidis vel subrubellis, squamis exterioribus cinereis; tepalis angustis recurvatis intense roseo-purpureis; cristis integris vel subintegris. CALIFORNIA. FRESNO CO.: Pine Ridge, 5,300 ft. alt., June 15-25, 1900, *H. M. Hall & H. P. Chandler 201* (DS *TYPE*, MO, NY, UC, US).

REGISTRATION OF NEW AMARYLLID CLONES

MR. W. D. MORTON, JR., *Emeritus Registrar*

MR. JAMES E. MAHAN, *Registrar*

MR. CHARLES HARDMAN, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an international basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62. 1960; Addendum, PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1971

Registered by John M. Cage, 740 Arroyo Road, Los Altos, Calif. 94022:

'Great Pumpkin' (Cage, 1971), R; A-919; D-5b; U—4-fld; 28″ h; 9½″ diam.; 3″ deep; burnt orange (Hcc-714); win.; dec.; ¼ *A. aulica* parentage; solid color; lanceolate leaves.

'Rojo Alto' (Cage, 1971) R; A-290; D-5a; U—4-fld, in late win.; 24″ high; fls 8″ diam.; oxblood red (HCC-820), throat shiny; cross of selfed 'Fire Dance' and selfed 'Athos'.

AMARYLLID NOTES, 1972

HAMILTON P. TRAUB

Cyrtanthus speciosus (L. f.) Traub, *comb. nov.* Syn.—*Crinum speciosum* L. f., Suppl. 195. 1781.

Cyrtanthus capensis Traub, *nom. nov.* Syn.—*Cyrtanthus speciosus* Dyer, Fl. Pl. S. Afr. 22: pl. 868. 1942; Herbertia 15: 17, pl. 216, f. 2. 1948 (1949), non *Crinum speciosum* L. f. Suppl. 195. 1781.

Cyrthanthus speciosus forma *magnificus* (Bak.) Traub, *comb. nov.* Syn.—*Vallota purpurea* var. *magnificus* Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896; *Cyrtanthus purpureus* forma *magnificus* (Bak.) Traub, Plant Life 25: 48. 1969.

Cyrtanthus speciosus forma *albus* (Bak. ex Traub) Traub, *comb. nov.* Syn.—*Cyrtanthus purpureus* forma *albus* Bak. ex Traub, in Plant Life 25: 48. 1969, cf. Bak. Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Subgenus *Anoiganthus* (Bak.) Traub, *subg. nov.* Genus *Cyrtanthus* Ait. Syn.— Genus *Anoiganthus* Bak., in Jour. Bot. 16: 76. 1878.

Pyrolirion xiphopetalum (Baker) Sealy, emend. As indicated by Cardenas in PLANT LIFE 27: 38. 1971, the leaves of this species were unknown up to 1971. Under date of July 6, 1971, Dr. Cardenas furnished the first data about the leaves of this species—leaves 1 or 2, linear, up to 15 cm. long, up to 4 mm. wide, apex acute.

Allium atrorubens subsp. *inyonis* (Jones) Traub, *comb. nov.*, Syn.—*Allium inyonis* M. E. Jones, Contr. West Bot. 10: 86. 1902; *Allium atrorubens* var. *inyonis* (M. E. Jones) Ownbey & Aase, in Munz & Keck, Calif. Flora, 1377. 1959, *without lit. cit.*

Allium fimbriatum subsp. *mohavense* (Jepson) Traub & Ownbey, *comb. nov. emend.* Syn.—*Allium fimbriatum* var. *mohavense* Jepson, Fl. Calif. 1: 273. 1922; Munz & Keck, Calif. Flora, 1376. 1959; *Allium mohavense* (Jepson) Tidstr., Proc. Biol. Soc. Wash. 48: 39. 1935; *Allium fimbriatum* subsp. *mohavense* (Tidestr.) Traub & Ownbey, Plant Life 23: 110. 1967, with *incorrect basionym.*

Allium howellii subsp. *sanbenitense* (Traub) Traub and Ownbey, *comb. nov.* Syn.—*Allium sanbenitense* Traub Herbertia 12: 68. 1945 (1947); *Allium howellii* var. *sanbetinense* (Traub) Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *with inadequate lit. cit.*

Allium sanbornii subsp. *inactum* (Jeps.) Traub, *comb. nov.* Syn.—*Allium inactum* Jeps. Fl. Calif. 1: 273. 1921: *A. sanbornii* var. *congdonii* Jeps., in Fl. Calif. 1: 275. 1921; Munz & Keck, Calif. Flora, 1375. 1959.

Allium melliferum Traub, *sp. nov.* Section *Rhophetoprason,* Subgenus *Amarallium,* Genus *Allium* (Alliaceae).

Bulbis novis ad apicem rhizomatum brevium efferentibus, bulbo veto plerumque non persistenti; foliis 3 vel 4 canaliculatis usque ad 30 cm. longis; scapo 35 cm. longo; spatha 1.6 cm. longa; umbella multiflora; pedicellis 2 cm. longis; ovario 1.5 mm. longo, 1.5 mm. lato, brevissime tricristato; floribus albidis, tepalis lavendulo-carinatis, introrsum ad centrum ut videtur lavendulo-vittatis; staminibus tepalis paulo brevioribus; stylo stamina subaequanti; stigmate acuto; floribus suffimento melloideo praecipue in tempore tarde pomeridiano usque ad primum mane efferentibus.

Holotypus No. 1017 (TRA), August 10, 1971, grown at La Jolla, Calif. from stock obtained from Dr. Marion Ownbey, Washington State University, under his No. 947. This stock was originally collected by Rogers McVaugh, No. 13710, Oct. 23, 1952, in western Jalisco, ''in shallow soil pockets on high bare rocky knobs in pine forest, summit, 7 miles west of Los Volcanes, road to Mascota, 1900—2000 m.''

Paratype No. 1016 (TRA) with a similar history, August 15, 1968, specimen without bulb.

Caloscordum tubiflorum (Rendle) Traub, *comb. nov.*, Syn.—*Allium tubiflorum* Rendle, in J. Bot. Lond. xliv: 44-45, pl 476, figs. C, 8—11. 1906.

Alstroemeria x *racinae* Traub *hybr. nov.*, Traub, Plant Life 8: 85. 1952, *anglice*. Plantae inter parentes (*A. caryophyllaea et A. pulchella*) in cruce reciproca intermediae. Holotypus: B. M. Foster, s. n. (No. 472 TRA), cult. Orlando, Florida, 11-3-51; Paratype, same history (No. 473 TRA). Plate 13, Plant Life 6: 84. 1950, type illustration.

Alstroemeria x *orpetiae* Traub, *hybr. nov.* Plantae inter parentes (A. violacea Phil. x A. pelegrina f. alba) in cruce reciproca intermediae, floribus in generatione primo purpureis, in generationibus secundis sequentibusque plantas purpureofloras et plantas albifloras procreantibus. Holotypus: No. 868-TRA, 5-1-58, H. P. Traub, Cult. La Jolla, Calif.

CHROMOSOME STUDIES IN **AMARYLLIS** L. CULTIVARS

The following reprints have been received:

(a) Aneusomatsy in an Amaryllis Hybrid, by T. N. Khoshoo & Prakash Narin, National Botanic Gardens, Lucknow, India (in Jour. Genetics & Plant Breeding 27: 322-333, 1967).

(b) Cytogenetic Survey of Amaryllis Cultivars, by Prakash Narin and T. N. Khoshoo, National Botanic Gardens, Lucknow, India. (in Jour. Cytology & Genetics 3: 41-45, 1968).

EDITOR'S MAIL BAG—continued from page 31.

It is with great sadness that we have to report the death of Wyndham Hayward at Orlando, Florida on October 1, 1971. Mr. Hayward received the 1958 William Herbert Medal. See PLANT LIFE 14: 7—8. 1958 for brief autobiography.

PLANT LIFE LIBRARY—continued from page 32.

EXPERIMENTAL BIOLOGY, 2nd ed. by Richard W. Van Norman. Prentice-Hall, Englewood Cliffs. N. J. 07632. 1971. Pp. xiii+269. Illus. $9.95. This is the revised second edition of a standard text on experimental biology by an outstanding authority in the field. The subject is discussed under the headings science, research in biology, biological literature, selection of techniques, selection and preparation of organisms, centrifuges, microscopy, colorimetry—spectrophotometry, measurements of gas exchange, chromatography, isotopic tracers, electrical measurements, other physical methods, calculation of data, statistical treatments, experimental design, and the manuscript. This valuable text is very highly recommended to the beginning student in experimental biology.

PROCEEDINGS OF THE XI INTERNATIONAL GRASSLAND CONGRESS; held at Surfers Paradise, Queensland, Australia, 13—23 April 1970. Edited by M. J. T. Norman, University of Queensland Press. Distributed by International Scholarly Book Service, P. O. Box 4347, Portland, Oregon. 1970. Pp. xxxi+A-143+956. $33.75. In this volume, the plenary and section papers of the Congress by outstanding authorities from various parts of the World are preserved for ready reference. Section papers are grouped under natural grasslands, woodlands and shrublands, sown pastures for animal production, plant improvement and seed production, plant nutrition and soil fertility, physiology of pasture and forage plants, pasture and forage production and ecology, pastures and forages in animal nutrition, and management and use of pastures and forage crops. Very highly recommended to all interested in grasslands management.

THE ENDEMIC FLORA OF TASMANIA, PART III, by Margaret Stones and Winifred Curtis. With a foreword by Lord Talbot de Malahide, Ariel Press, 14 King St., Covent Garden, London W. C. 2. 1971. This is part III of the monograph on the endemic flora of Tasmania. It is beautifully reproduced in color from plates prepared by Margaret Stones together with botanical and ecological text by Winifred Curtis. The foreword is by Lord Talbot de Malahide, the financial sponsor, who also provided the appendix on cultivation. The plates XLVIII to LXXI, accommodate 41 different plants, which are classified by plant families. A map of Tasmania at the beginning of this 3rd. volume, in seven colors to indicate approximate heights, is a valuable aid in finding the geographical location of the species. It is indicated that the Monograph will extend beyond the five parts originally planned. This excellent monograph cannot be too highly praised and we can hardly wait for the appearance of the remaining parts.

INTRODUCTION TO THE FINE STRUCTURE OF PLANT CELLS, by Myron C. Ledbetter and Keith R. Porter. Springer-Verlag, New York, 175 5th Av., New York, N. Y. 10010. 1970. Pp. 188. Illus. $14.80. Designed as a supplementary text for students of cell biology, and to introduce the research scientist, teacher and student of allied fields to the rapidly expanding subject of cell study by means of the electron microscope, this outstanding new book fills a definite need. The more than fifty full-page plates provide a survey of plant cells and their components as revealed by the electron microscope. The plates are grouped under general cell structure, fine structure interphase cell and cell organelles, dividing cells, cell wall and plasmadesmata, vacular tissues, schlerenchyma and collenchyma, epidermal cells and variants, photosynthetic apparatus, cells with special inclusions, and germinative cells. The plates are beautifully reproduced, and are accompanied by explanatory text discussions. This very important new book is indispensable to all who are interested in plants. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 128.

3. GENETICS AND BREEDING

AMARYLLIS BREEDING WITH EMPHASIS ON INBREEDING

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Fairly early in his work with *amaryllis,* but not as early as he would have liked, the writer studied the development of hybrid corn. The corn hybridists created pure inbred lines with known genetic factors and then crossed these lines to obtain uniformity plus extreme hybrid vigor (heterosis). The inbred plants were developed either by selfing, by crossing on siblings, or by crossing on other close relatives. All these procedures constitute inbreeding.

Geneticists can express the *degree* of inbreeding of a given seedling if they know its family tree. A high degree of inbreeding is most rapidly achieved by selfing, but forms of sterility often occur when selfing is attempted, and the problem becomes worse with succeeding generations. This kind of sterility seems to abound in *Amaryllis,* and it has destroyed many inbreeding plans. However, the author feels that inbreeding and then selective crossing afford the greatest opportunity for the amateur to make significant contributions—if the sterility problem can be solved. Several procedures that have proved helpful are described below.

First, consider for example the frustration of attempting to develop a pure white Amaryllis of good form, good vigor, and large size by starting with a small white clone having low vigor and poor form and a large red clone with high vigor and good form. Even if these characters are fixed and uniform in the two clones and each character is determined by a single non-dominant gene, the first generation crosses will be light red, of medium vigor and size, and of fair form. Crossing two of the siblings will give offspring with the following probabilities:

25% will probably be pure white
25% will probably have good form
25% will probably be large
25% will probably be vigorous

In other words, after two generations, one plant in 128 would have all the desired characters *on the average.* You *might* get only one desired result in a thousand. If each character were determined by two or more genes, if each original parent were a cross breed of mixed parentage, and if such phenomena as sex-linked genes occur, many thousands of seedlings and many generations of selective crossing would probably be required to get the desired result.

To obtain a large exhibition-type yellow clone in one man's life span from *Amaryllis evansiae* and a white clone of mixed parentage seems like a pious hope to the author. Of course, the effort is great fun.

The use of inbreeding to stabilize the desired characters would probably simplify most breeding programs and give hybrid vigor as a bonus. Following are some treatments that have been successful in some cases to combat sterility.

1. Spraying the style, immature anthers, and the ovaries of parent plants with an aerosol or standard solution of gibberellic acid is often effective where the problem is failure of initial fertilization. Repeated spraying from one week prior to pollination to two weeks afterward is suggested.

2. Often, initial fertilization will occur, but the seed pod will wither before maturity of the seeds. Here, gibberellins seem to help sometimes, but additional or alternative treatments seem effective. One simple treatment is to cut the scape off near the bulb shortly after fertilization and to mature the seed pods by immersing the cut end of the scape in water containing a little Captan or other fungicide and storing in a warm, shady location.

3. Again, after fertilization, very light daily spraying of the ovary with beta-mephthoxyacetic acid, the auxin used to increase the set of tomatoes, has prevented premature abscission and dropping of the ovary in seemingly sterile crosses.

4. The treatment found most effective by the author in very obstinate cases is to spray the ovary and style with gibberellic acid or mixed gibberellins at the time of pollination and then to keep the ovary moist with the following solution until the seed pod has swelled to full size. Cotton moistened in the following solution was wrapped around the ovary and then protected by a wrapping of aluminum foil. In a water solution:

Mixed gibberelins (‘‘Wonder-Brel’’)	1 pt. per million
Sugar (sucrose)	2%
Rapidgro fertilizer	½ tsp. per gal.
N-Dimethylaminosuccinamic acid	½ tsp. per gal.

The last ingredient is a chemical used to prevent premature apple drop. The relative importance of the ingredients has not been thoroughly studied. Other mixtures are under investigation. It is realized that some chemicals are difficult to obtain by the amateur. Small vials of the solution described in method 4 are obtainable from the writer by serious workers at $20 per cc.

Selfing in a breeding program is controversial. For instance, in Plant Life, 1970, p. 118, the late Henry van Woesick, former head of the famous Ludwig and Company in Holland, advises against selfing. One cannot argue with the remarkable clones produced by the Dutch, but van Woesick's suggestion that selfing or any other form of close breeding is inevitably disastrous is not tenable. The inbred strains that go into the making of all hybrid tomato seeds are maintained through selfing. Selfing produces some freaks but also some uniformity if carried far enough.

Starting with the repeated selfing of one of the Ludwig clones, 'Fire Dance', the writer has developed a superior strain of very uniform, gorgeous reds. One parent is the third-generation self of 'Fire Dance', and the other parent is the third generation self of a cross between *Amaryllis reginae* and a selfed Dutch red. Two other inbred red strains show excellent heterosis when crossed with another inbred.

Many species of *Amaryllis,* which of course are inbred naturally, give great hybrid vigor when crossed with selfed strains, but one may require many generations of breeding to eliminate the unwanted characters of the species. A pleasant exception was a cross of *A evansiae* on a selfed strain of Dutch whites. Besides vigor, the only other trait of *evansiae* that shows in most seedlings is an ivory color. If inbred sterility can be conquered in this line, many inbreedings may eventually result in a deeper color.

Troubles can still linger even when sterility is defeated. From one selfed inbred, the seedlings were apparently haploid. That is, they seemed to contain only one set of chromosomes. They were about half the size of their parent, and further inbreeding seems impossible. Although the plants are weak, one is a pretty miniature pure white, but crossing with another white produced large, sterile, white blooms—larger than either parent. One logically supposes it to be a triploid. An attempt is now being made to double the chromosome numbers of these haploids.

The writer has made several crosses that were extremely obstinate. In several cases, the seedlings thereof grew very slowly and have not bloomed in four years. Some kind of chromosome maladjustment is suspected.

Besides the red hybrids mentioned above, the writer's most significant projects are as follows:

1. Two inbred white lines, one starting with the variety "American Beauty" and the other containing *A. evansiae* and Dutch white genes.
2. A flushed and spotted inbred line that produces beautiful crosses on *A. pardina* or on flushed inbreds.
3. Two selfed lines of miniature reds.
4. Hybrids with *A. aulica* blood. These are hard enough to cross with anything; selfing is a thing of the future for this line, but they have great vigor, good size, and outdoor hardiness in the San Francisco area.

The above projects and others require the growing of many seedlings to achieve distinction in a reasonable time. If anyone would like to collaborate in the development of some of these lines, please write the author. Intensive development should be more thrilling than random or "hunch" breeding, and there is plently of fun and glory to go around.

CHROMOSOME NUMBER AND GROWTH HABIT OF **SPREKANTHUS CAGEI**

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In Plant Life, volume 25, 1969, the author reported the first blossoming of an intergeneric hybrid of *Sprekelia formosissima* and *Habranthus robustus.* Since that report, bulbs of X *Sprekanthus cagei* Traub have fully matured, and further observations on culture and growth habits can now be made.

Also, chromosome studies on the plant have been made by W. S. Flory and his associates at Wake Forest University. These studies tend to confirm the opinion that genus *Sprekanthus* Traub is a true bigeneric hybrid and they tend to clarify the apparent complete sterility. The predominant count is 2n=66 in *Sprekanthus* Traub although some variation was found in chromosome numbers from cell to cell, which seems consistent with the variation found in the 120-chromosome race of *Sprekelia.* In *Sprekelia,* the count is 2n=120, and in Habranthus it is 2n=12. With 60 chromosomes from one parent and six from the other, viable crosses or selfs would seem improbable.

However, chromosome doubling in *Sprekanthus,* would be extremely interesting. Dr. Flory has suggested procedures for treatment with colchicine, and the author is presently trying to produce polyploidy. A tetraploid of the plant would hopefully be fertile.

Sprekanthus cagei grows and blooms well in the garden anywhere the soil does not freeze. Outside, its blooming habit is similar to that of *Habranthus,* but the scarlet blossoms, with just a hint of violet, are much prettier than *Habranthus* in the opinions of most people. Also, the segs are wider and the shape more graceful than in *Sprekelia.* Compared with *Sprekelia, Sprekanthus* blooms more freely and makes a much better recurrent-blooming pot plant. Every few months, the pots can be kept dry for a month to initiate bloom.

Sprekanthus forms many offsets, which can be grown to blooming size in about one year. The bulb could become commercially important. Cuttage has not yet been tried for propagation. A few mature bulbs will be made available in the fall of 1971.

CULTURE OF IMMATURE **AMARYLLIS** EMBRYOS

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Failure of apparently successful crosses after partial enlargement of the seed capsule is perhaps more exasperating than total incompatibility. Two weeks of anticipation are followed by the disappointment of observing abscission of the capsule at the base of the pedicel. This occurred in an attempted pollination of the clone 'Superba' with the pollen of *Amaryllis evansiae.* Hoping that viable embryos were present in the abscised capsule, an effort was made to retrieve the potential progeny of the cross.

METHODS

The recently abscised capsule was dipped momentarily in 95% ethanol and immersed for five minutes in 1% sodium hypochlorite (diluted laundry bleach). In a sterile transfer chamber, the capsule was then flamed twice with 95% ethanol and opened. Immature seeds averaging 4 mm in length were removed using standard sterile-culture techniques and placed on moist filter paper in Petri dishes. By transmitted light, those seeds containing small embryos approximately 1.5 mm long were selected for culture.

Table I

Stock Solutions for the Preparation of Amaryllis Culture Media

Macronutrient Solutions—Dilute 1:100 for final solutions (10 ml/1)

Component		Grams per liter
1. Calcium nitrate	$Ca(NO_3)_2.4H_2O$	118
Calcium chloride	$CaCl_2.2H_2O$	14.7
2. Potassium nitrate	KNO_3	50.5
Potassium phosphate monobasic	KH_2PO_4	13.6
3. Magnesium sulfate	$MgSO_4.7H_2O$	49.3
4. Disodium EDTA *	$Na_2EDTA.2H_2O$	3.7
Ferric chloride	$FeCl_3.6H_2O$	2.7

Micronutrient Solution—Dilute 1:1000 for final solutions (1 ml/1)

Component		Milligrams per liter
5. Manganese sulfate	$MnSO_4.H_2O$	1690
Zinc sulfate	$ZnSO_4.7H_2O$	1438
Potassium iodide	KI	830
Boric acid	H_3BO_3	618
Copper sulfate	$CuSO_4.5H_2O$	25
Sodium molybdate	$Na_2MoO_4.2H_2O$	25
Cobalt chloride	$Co\ Cl_2.6H_2O$	25

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* Dissolve the disodium salt of ethylenedinitrilotetraacetic acid before adding the ferric chloride.

A modified Hoagland's solution *(2)* was employed for culturing embryos and the resulting seedlings. Salt components of the nutrient medium with suggested concentrations of compatible reagents for stock solutions are listed in Table I. Sucrose at 2% (20 g/1) and 1% agar (10 g/1) were included in the first stage embryo-culture medium. Benlate* (benomyl, methyl 1-butylcarbamoyl-2-benzimidazolecarbamate) added to media at 10mg/1 served as a useful fungistat *(3)*. Sucrose was deleted for the second stage medium; plantlets were transferred to the latter no sooner than the appearance of the second leaf. Seedlings were later grown in horticultural vermiculite using the basic salt solution diluted with four additional parts of water. All solutions were adjusted to pH 5.5 with dilute sodium hydroxide or hydrochloric acid prior to the addition of agar.

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* Benlate, a Dupont product, is also useful in controlling damping off of "difficult" seedlings in open culture.

Approximately 15 ml of nutrient medium were dispensed to each 20x150 mm culture tube for both aseptic stages. Tubes were capped with polypropylene closures and sterilized under pressure in an autoclave for 15 minutes at 121°C. One selected immature seed was placed in each tube after cooling and solidification of the medium. Agar surfaces prepared slanted at 30° facilitated later removal of seedlings. Cultures were illuminated by lateral banks of 40 watt cool white fluorescent lamps at a distance of 15 cm on a 16-hour photoperiod. Ambient temperatures during aseptic culture were 27 ± 5°C.

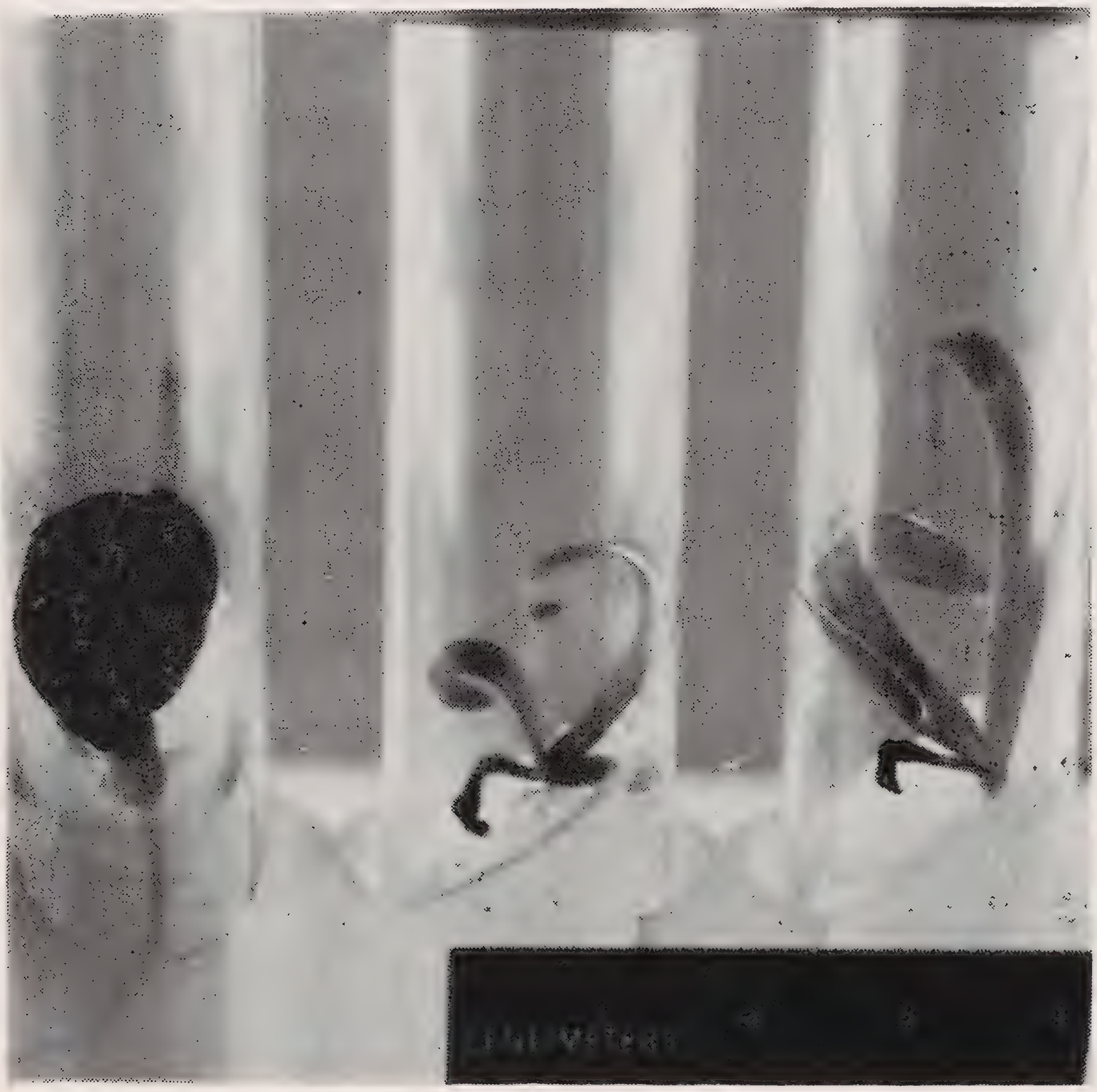

Fig. 21. Amaryllis plants at middle and right grown asceptically from immature embryos. Left, mature seed germinated for scale comparison

RESULTS AND DISCUSSION

No visible development of endosperm was observed in the excised seeds. Germination was evident five days after transfer to the first-stage medium. A diminutive radicle emerged from the micropyle end of the seed and penetrated the agar. Approximately two weeks later, the first foliage leaves were observed on successful cultures. Development varied from seedling to seedling, but half of the cultures had produced a second foliage leaf six weeks after initiating the cultures. Of ten attempts, eight reached the two-leaf stage by the eighth week. Transferred to the second-stage medium lacking sucrose, all of the latter continued to enlarge. Two of the successful cultures during the fourth week after transfer to the second stage medium are illustrated (see Fig. 21). For comparison, a mature seed of a tetraploid cross had been grown aseptically on the first-stage medium. The addition of casein hydrolysate at 400 mg/1 did not further enhance growth of immature embryos similarly cultured with this often-included supplement. Mature seeds appeared to germinate more readily on the basic salt-agar medium than on that containing sucrose.

A point to be emphasized is the simplicity of the medium employed here for embryo culture. It appears that no growth regulators nor vitamins need be included. Iodide may not be required, but was incorporated in the micronutrient solution since White (*6*) indicated that tomato roots in culture grow better with iodide than in its absence. The medium differs from the original solution of Hoagland and Arnon (*2*) in two other important aspects: increased calcium content and the use of chelated iron. Cobalt may or may not be required by Amaryllids but is now generally included in culture media in traces. Seedlings have now been grown in vermiculite on the diluted salt solution for one full year and have exceeded the growth of similar-age seedlings grown in standard potting soil.

Techniques described here prepare the way for further ventures in sterile culture of Amaryllids. Culture of actively growing meristems may allow rapid multiplication of those which are difficult to propagate. Moreover, new methods employed for orchids might well be considered (*1,4*). Culture of meristemmatic tissue of virus-infected plants is another worthy consideration, especially when a new clone appears infected. One might treat diploid species such as *A. evansiae* with colchine aseptically with sucrose present on the recovery medium. Finally, anther culture, as in the techniques employed for tobacco (*5*), may result in the production of diploids from tetraploids, allowing fertile progeny to result when combining conventional germ plasm—the large tetraploid hybrids —with the recently described and most interesting diploid species. Anthers of tetraploids prepared for flowering appeared to me to be beyond the point at which one could expect embryogenesis from pollen. Even when anthers were removed by cutting these bulbs to expose buds, the pollen appeared developed past tetrads. In several attempts, anthers dissected from such exposed buds failed to develop further on the first-stage medium.

I suspect that the results of the cross described here will be triploid plants with little, if any, fertility. However, one plantlet has also been produced by this method when *A. belladonna* x *evansiae* provided by Mrs. Korsakoff resulted in a partially developed capsule which abscised similarly after selfing.

LITERATURE CITED

1. Churchill, M. E., J. Arditti and E. A. Ball. 1971. Clonal propagation of orchids from leaf tips. Amer. Orch. Soc. Bull. 40:109-113.

2. Hoagland, D. R., and D. I. Arnon. 1950. The water-culture method for growing plants without soil. Calif. Agr. Exp. Sta. Circ. 347.

3. Oberbacher, M. F., and G. E. Brown. 1968. Use of benzimidazoles for control of fungi in peel cultures of citrus fruits Hort. Science 3:286-287.

4. Steward, F. C., and M. O. Mapes. 1971. Morphogenesis in aseptic cell cultures of **Cymbidium.** Bot. Gaz. 132:65-70.

5. Sunderland, N., and F. N. Wicks. 1971. Embryoid formation in pollen grains of **Nicotiana tabacum.** J. Exp. Bot. 22:213-26.

6. White, P. R. 1963. The Cultivation of Animal and Plant Cells. 2nd edition. The Ronald Press Co. New York.

A NEW LYCORIS SPECIES?

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During flowering seasons of 1968, ’69 and ’70 I have had a total of eleven scapes of a ‘‘different,’’ unidentified *Lycoris* to appear mixed in with other kinds from various sources. Scapes run to 21″ high with as many as eight flowers, making fairly large umbels up to 8¾″ across (see Fig. 22). Segments are relatively wide and smooth, but with some ruffling of the edges. Flowers are not of spiderlily form, although mine have appeared mostly among commercial ‘‘L. albiflora’’ stocks which do have the typical spiderlily pattern. A confusing factor is that color in different individuals varies. Mostly it runs to the daylily fanciers’ ‘‘melon’’ tints—soft salmon or creamy orange—but one is lighter and almost yellow, while another has deeper shaded flowers, near bronze.

The flowers appeared among bulbs from the following sources:

1. Imported Japanese bulbs labeled ‘‘L. albiflora,’’ received from the old Walter Guille bulb firm in 1959. Most of these have been blooming for years with off-white cream, pinkish and salmon tinted spiderlily flowers typical of *L. elsiae.*

2. Imported Japanese bulbs labeled ‘‘L. aurea Vermilion,’’ received from R. D. Goedert in 1964. Most of these, too, have been producing the usual flowers expected from commercial Japanese ‘‘albifloras.’’

3. A bulb sent me in 1962 by Caroline Dormon, Louisiana botanist-gardener, who had received it as an unidentified *Lycoris* from Dr. Tsuneshige Rokujo, in Japan.

4. A bulb sent me in 1964 by B. Y. Morrison, labeled ‘‘L. albiflora Tawny Yellow,’’ with the explanation that it had just shown up in some Japanese ‘‘albifloras’’ he had been growing for years.

These bulbs had all been growing with others in my lycoris cold-frames for four to nine years before blooming in 1968. This may be because the previous winter here had been unusually mild. It could be that our normal winters here do not kill these bulbs but do inhibit their flowering.

Foliage of these bulbs is so much like that of the "albifloras" with which they are growing that I had never noticed them prior to their blooming. After they did flower I marked each one with a stake, so as to observe foliage more carefully. This, again, brought confusion; although all of them started foliage growth weeks later than the "albifloras," they did not all start at the same time. Notes taken Dec. 3, 1968 showed one clump of the new lycoris with leaves 12 to 16″ tall. Another, just a few feet away, had leaves only three inches high, and a third individual had leaves barely emerging from the ground.

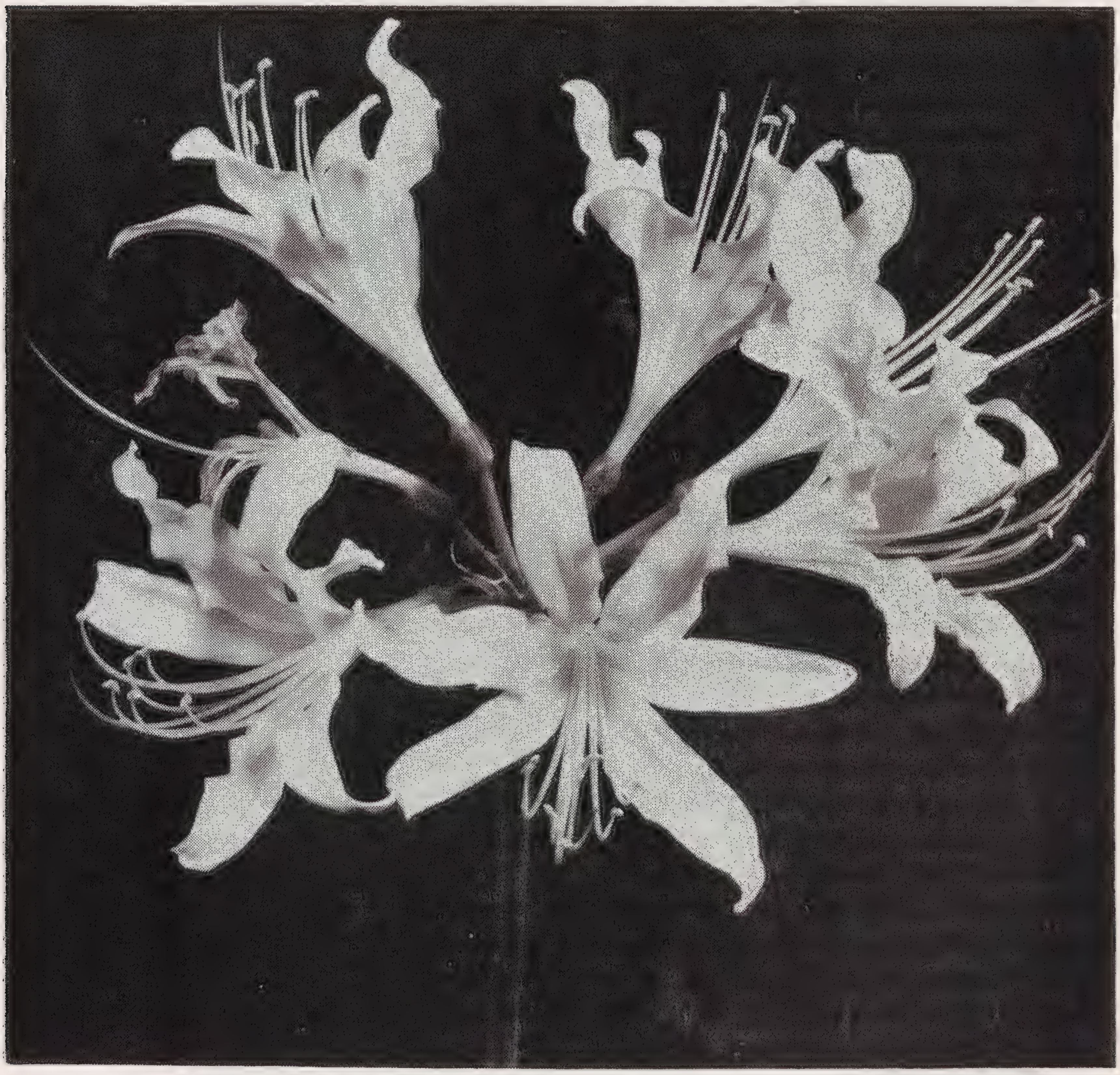

Fig. 22. Unidentified **Lycoris** species (?) flowering at Nashville, Tenn. Photo by Sam Caldwell.

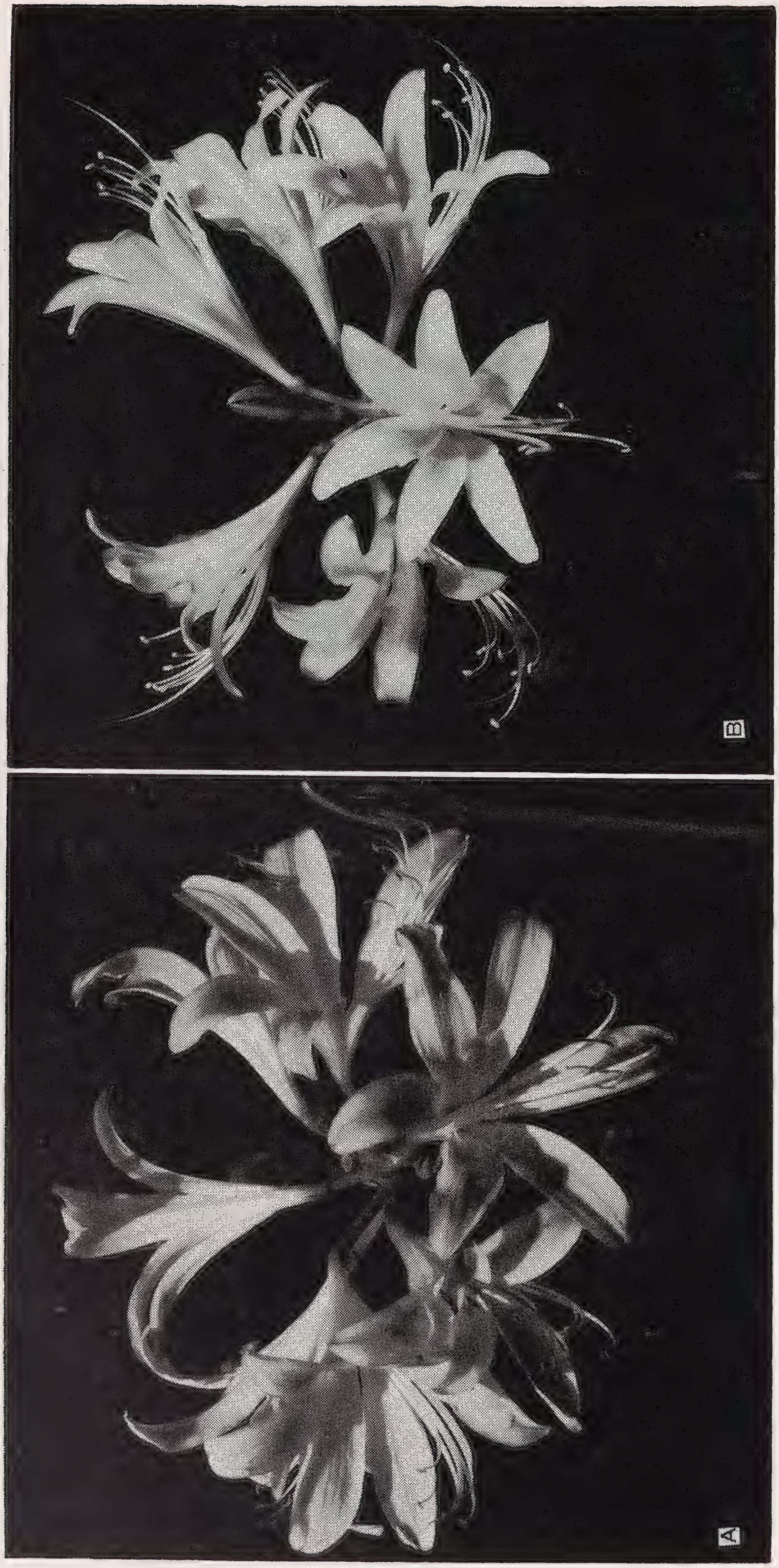

Fig. 23. **Left,** "Hayjax 1", selected seedling from **Lycoris haywardii x L. x jacksoniana** cross. **Right, Lycoris sprengeri x L. traubii** cross. Photos by Sam Caldwell.

Surely other bulb fanciers must have observed this lycoris. Information about it should be sent to Dr. Traub. For convenience I have simply labeled mine, "L. Melon." I suspect that it is the same lycoris sold for several years by the late James Giridlian through his Oakhurst Gardens catalog as "L. cinnabarium" (not "cinnabarina"). I now have some of his stock for comparison but have had no blossoms as yet.

This also may be the same lycoris as that pictured by Dr. Traub on page 59 of the 1966 *Plant Life* as possibly *L. koreana.* My impression is that koreana is close to the orange colored *L. sanguinea* and related *L. kiushiana* and "cinnabarina," all of which I have flowered. The new lycoris does, indeed, bear some resemblance to these. But with me sanguinea and relatives all make foliage in spring—starting in March—and are the first lycorises to bloom—usually in July. The new one is among the last to flower—around September 11—and foliage follows later in the fall or early winter. Incidentally, it is apparently fertile. One scape produced a seed pod which on maturing yielded one large, shiny black seed.

1970 LYCORIS REPORT

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I began cross breeding *Lycoris* species in 1954. First hybrid blooms (*L. sprengeri* X *L. radiata,* now known as *L.* x *jacksoniana*) opened in 1961, and later years brought flowers from other crosses. Readers interested in this genus may wish to refer to my reports in the 1962, '64, '65 and '68 volumes of Plant Life for notes and photographs related to the hybridizing program. This current report covers bloom of 1968, '69 and '70. Many exciting new things appeared during these three seasons. Abbreviated descriptions follow, and accompanying photographs show some of the best ones.

L. haywardii X *L.* x *jacksoniana:* Cross made in 1961. First flowers in 1966, more each year since. Similar to *jacksoniana* but averaging a little larger flowers on taller scapes; color varies in the pinkish, lavender, violet range. One seedling, first flowering mid-August, 1968, is outstanding—a large, robust grower with scapes to 28″ tall and widely flared, smoothly tailored flowers, lavender-pink, turning bluish with age. Usually seven flowers to the umbel, which is 7⅛″ across. Reminds one of *L. squamigera* but is deeper colored and not quite as large. Apparently a good propagator, judging from foliage clump. For the present identified simply as "Hayjax 1."

L. sprengeri X *L. traubii:* Cross made in 1961 on my own *sprengeri* with *traubii* pollen mailed to me by the late B. Y. Morrison, Pass Christian, Miss. There are just nine bulbs; seven have bloomed. A most rewarding and exciting cross—better I think, than other crosses of

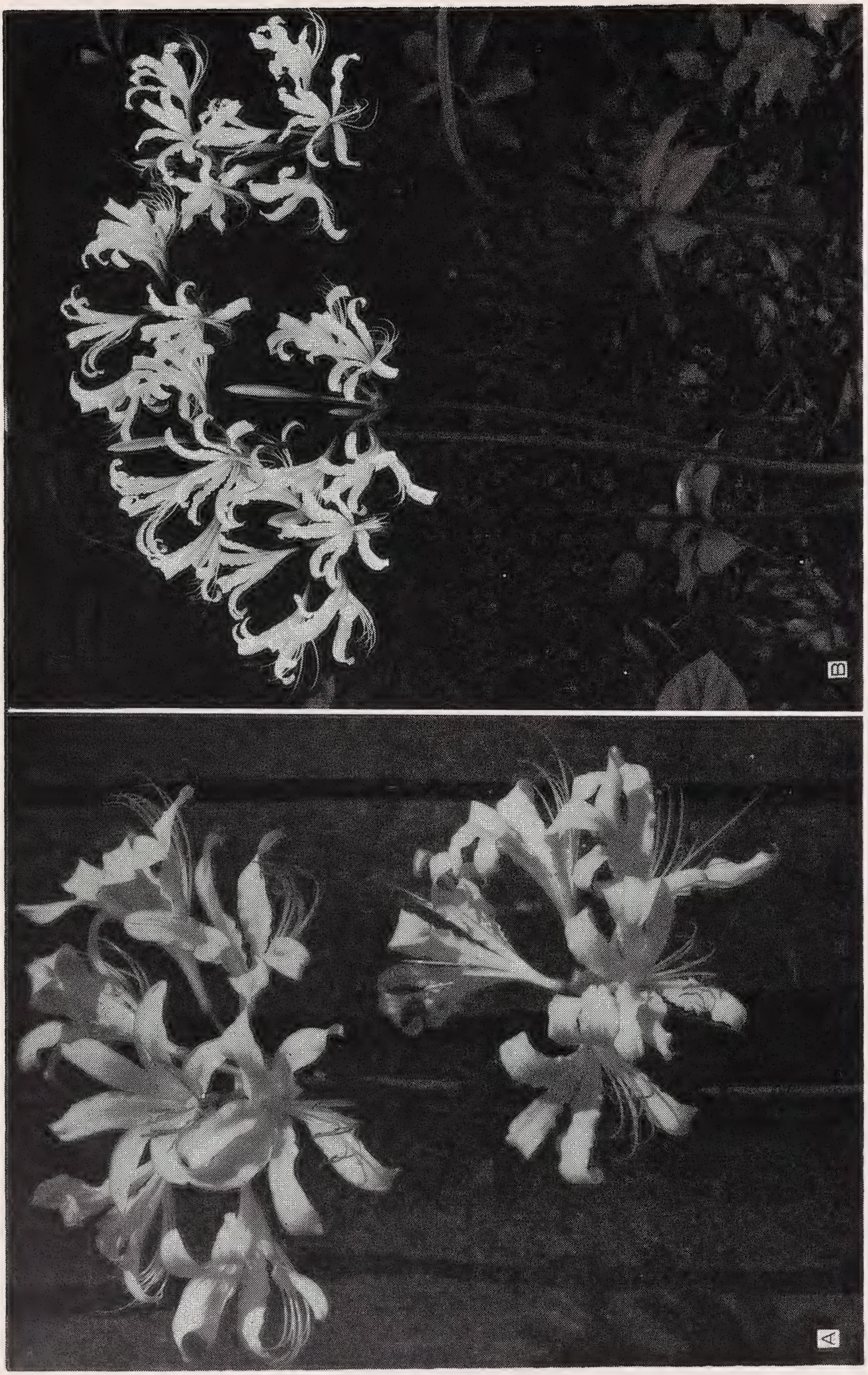

Fig. 24. **Left, Lycoris haywardii x L. chinensis. Right, Lycoris haywardii x L. "sperryi."** Photos by Sam Caldwell.

sprengeri with other yellow species. Bulbs produce thick, sturdy scapes with relatively large flowers, and there is variation in both color and flower form. Bloom in late August, early September.

One distinctive seedling has a big umbel on a 25″ scape with smooth, broad-segment flowers close to *sprengeri* form. Color is pale lilac-blue with a bit of gray in it, reminiscent of the ''smoky'' gladiolus; amber lines radiate out from base of each segment. Another is a soft buff-pink color with suggestion of lavender, reminding one of an opal. Segments unusually broad, to 11/16″, with edges beautifully ruffled. Others run in light pastel tints from pale lilac or ''skim milk'' color to cream and pink.

This cross should be tried by growers in the Lower South who have *L. traubii.* I will gladly furnish *sprengeri* pollen by mail on request as it is available, usually in the last half of August with me. While I used *L. sprengeri* as the seed parent, similar results should come from the reverse cross.

L. radiata X *L. traubii:* Cross made in 1961 on fertile *radiata* with *traubii* pollen from Mr. Morrison. First bloom September 13, 1968, a 19″ scape with six flowers making a 7″-wide umbel. Color, very pale cream-yellow with pinkish tints. Flower is practically identical to some of those on stocks of commercial Japanese ''albiflora'' bulbs and tends to confirm the theory that *L. albiflora* is a natural hybrid of *L. radiata* and a yellow species.

L. sanguinea X *L. ''sperryi'':* Cross made in 1961. Only three bulbs resulted; all flowered mid-August, 1969 and '70. Flowers are medium size, quite pretty spiderlily form and clear, medium yellow color. These need further observation. They may fill the need for a straight medium yellow lycoris without the orange shading of most yellow flowered species.

L. chinensis X *L. ''cinnabarina''* (L. ''*cinnabarina*'' is a ''catalog'' name; the lycoris is close to orange-flowered *L. sanguinea,* with longer flower segments. It has not bloomed well for me.) : Cross made in 1963. Just two bulbs; one flowered Aug. 13, 1969, a 12½″ scape with five flowers making a surprisingly large umbel, 8½″ across. Segments well rippled on edges and flower is close to spiderlily form. Might be described as a ''sunset'' colored lycoris, clear yellow on opening but on succeeding days edges of segments develop reddish-orange tints, as do the stamens and pistil. Bloomed again in 1970. This one looks promising.

L. haywardii X *L. chinensis:* Cross made in 1964; a half dozen bulbs grew and two flowered Aug. 12, 1969, five years from seed. Most crosses take six, seven or more years to bloom but seedlings from *haywardii* seem to be fastest. Even with them I have never had a bloom from seed in less than five years.

These are flowers of good size—umbels to 8½″ across. One opens pale creamy-yellow with lilac suffusions; the other has similar but warmer coloring—less lilac and more cream and buff tints. Both blooms age

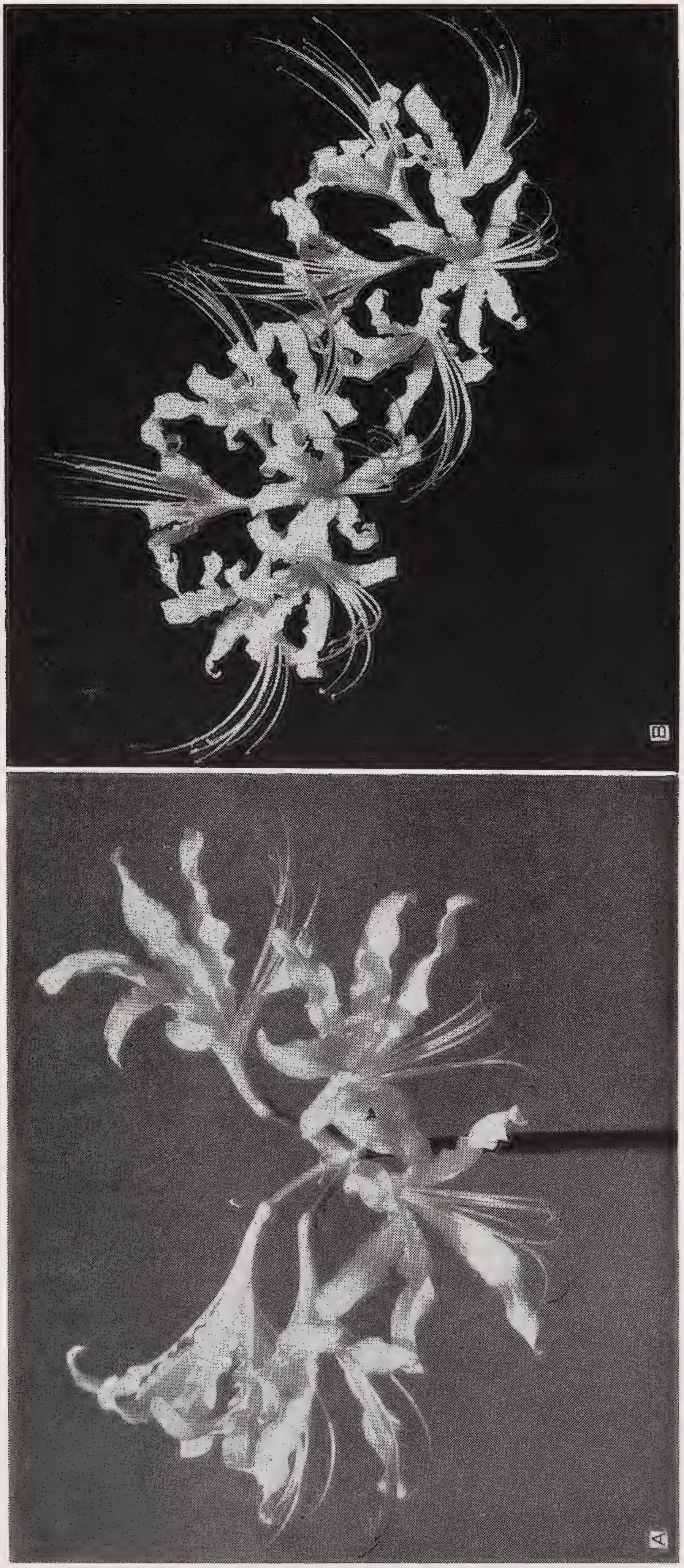

Fig. 25. Left, **Lycoris chinensis** x **L.** “cinnabarina”. Right, **Lycoris radiata** x **L. chinensis** or **L.** “sperryi,” named 'Fawn', parentage unknown. Photos by Sam Caldwell.

to off-white. It is interesting to note that these flowers differ from those produced previously by a similar cross, *L. haywardii* X *L. "sperryi."* Those practically all turned out near white with segments generally narrower than in the *haywardii-chinensis* hybrids.

L. haywardii X *L. "sperryi":* Cross made in 1958. First bloom was reported in the 1965 Plant Life; now that some twenty seedlings have flowered, this additional note is given. All are much alike, big, vigorous lycorises, quite hardy and thus far good bloomers under outdoor garden conditions in my area. In bud and early opening stages there are pinkish midrib lines and pale yellow coloring on most of the flowers but the over-all effect at peak bloom is white.

L. sprengeri X *L. "sperryi":* Cross made in 1959. Just a few of these have bloomed. Except for slightly wider segments most of these look like flowers of the *haywardii-"sperryi"* cross described immediately above. One, however, blooming first in 1968, has a big bloom of soft yellow color which holds the color fairly well even on aging. Unfortunately, this seems a slow natural propagator; although eleven years old from seed, it has made only two bulbs.

L. 'Fawn': This remarkably beautiful lycoris brought the greatest thrill of the 1968 bloom season when two scapes reached peak development on Sept. 6 (Fig. 25.). On scapes 15 and 16″ tall, respectively, with five and six flowers, the umbels are of classic spiderlily form, with relatively wide segments much ruffled along edges and reflexed at the tips. Flowers are evenly spaced to give round, symmetrical unbels which with long extending stamens reach 7¾″ across. Color on opening is a pastel tint of creamy-buff with deeper pinkish salmon bands from center of flower outward. A tawny effect in the throat suggests coloring I have seen on a young deer; hence the provisional name, 'Fawn.' Flowers age to off-white with pinkish tints. It bloomed also in 1969 and '70.

Apparently a good propagator, the original bulb has grown into a clump. Unfortunately, this is one of the rare cases in which I do not know the parentage. It is in a group of *L. sprengeri* X *L.* x *jacksoniana* seedlings from 1961, but obviously is not of that parentage. My records show that a small lot of seeds, while temporarily stored in a pot under my greenhouse bench, was upset—probably by a mouse—and mixed with other crosses I had made. Undoubtedly one of the parents is *L. radiata* and the other is probably either *L. chinensis* or *L. "sperryi"*, since I have made those crosses many times. Seedlings previously flowered from such crosses, however, have run uniformly to a soft yellow coloring, though their form has been like that of 'Fawn.' Perhaps 'Fawn' is a lucky color variation, or there is a possibility that this is a *radiata-houdyshelii* cross—one I have tried often with no visible success as yet.

NEW ACQUISITIONS

By great good fortune I have met through correspondence this year Dr. Shiuchi Hirao, an enthusiastic amateur gardener-horticulturist in

Japan who has a special interest in amaryllids. He has shared with me rare bulbs, including three unidentified lycorises which may prove to be new species. One resembles *L. sprengeri* in form but is a clear lilac self color; another is off-white and the third is yellow. I hope to report on these in future years.

Through his influence eight of my color pictures of lycoris species and hybrids were published in a full page lay-out in the Autumn, 1970 issue of *Garden Life,* a leading Japanese garden quarterly, along with a translation of some of my observations on their culture in this country. We hope to increase popular interest in the genus in Japan and encourage the search for additional kinds not now in cultivation that may occur there in the wild.

Dr. Hirao also sent me bulbs of his own strain of *Nerine* hybrids. Four have flowered; they are most varied and beautiful, comparing favorably with some of the fine English introductions.

Finally, having strayed briefly from lycorises, may I ask if any of our members know whether anyone is attempting to propagate and distribute hymenocallis hybrids originated by the late Len Woelfle, of Cincinnati, Ohio? (See ''Hymenocallis Report from Ohio,'' Plant Life 1962.) These are very beautiful, easily grown flowers, and I think, have commercial possibilities. Mr. Woelfle sent me a small offset of 'Pax,' his first hybrid, in 1963 and similar offsets of 'Icon' and 'Helios' the next year. All have thrived under normal ''Gladiolus culture'' customarily used for the common ''Peruvian daffodils.'' 'Helios' seems to me the best of the lot; it has deeper yellow coloring which is held better through the life of the flower, but the other two are well worth growing.

AMARYLLIS BREEDING—1971 REPORT

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Following a rather poor Amaryllis bloom season in 1970, I resolved to remedy this situation and my efforts were rewarded with bountiful bloom in 1971. Plenty of moisture and liquid fertilizer during the growing season did the job. The *Amaryllis* species and hybrids were grown outdoors during the summer of 1970, getting about a half day of sun, plenty of water and liquid fertilizer every 3-4 weeks. Growth was excellent under these conditions, particularly for those plants whose pots were imbedded in mulch (sugar cane bagasse). This keeps the pots from drying out. Most small clay pots dry out almost completely during our hot summers even though they may be watered daily. This significantly retards growth rate. Simply imbedding the pots in the mulch alleviates this condition. I presume other mulches or imbedding the pots in the soil would work as well as the bagasse.

I have previously mentioned the six *Amaryllis* species sent to me under number by Dr. Cardenas in 1969. I grew these *Amaryllids* with great anticipation because of (1) the area in Bolivia in which these plants were collected, an area seldom visited by collectors, and (2) the generally vigorous growth shown by most of these species. The anticipation was not only for several new species useful in hybridizing, but also for excellent hybrid vigor among the progeny. My anticipation was not in vain.

These amaryllids were only identified by numbers one through six. Late in December, 1970 bloom scapes appeared on three of these species, Nos. 4, 5 and 6. Number 4 made two scapes, while Nos. 5 and 6 had one scape each. Blooms opened on numbers 4 and 5 almost simultaneously during the third week in January, and number 6 opened about a week later. All three were very striking and beautiful *Amaryllis.*

My unidentified species Number 5 is definitely *A. nelsonii,* which was described by Dr. Cardenas in PLANT LIFE (1971). Not having this description available to me at the time of my bloom, I considered it nearer to *A. mandonii* rather than *A. yungacensis* which it also resembles. My *A. nelsonii* bloomed on a 22 inch scape, with two florets, 5 inches across the face, 4½ inches long and nearly tubeless. The bloom posture is slightly above the horizontal. I consider the most striking feature of *A. nelsonii* to be its bold and contrasting color pattern. Deep in the throat the coloration is dark green, shading to greenish white over 70-80% of the length of the segments. The final 20-30% of the segments is marked with intensely contrasting scarlet red. The interior of the throat is marked with very small brownish-red spots.

A. nelsonii should be a valuable addition to the *Amaryllis* species for use in hybridizing. For me it grows vigorously, and hopefully will transmit this to its offspring. One bloom of *A. nelsonii* was self pollenated and the other was pollenated with unidentified species number 4 (described subsequently). Only the self pollenation set seed. I planted some and distributed some to other growers. *A. nelsonii* should therefore be easy to reproduce and distribute since it is self fertile.

My unidentified species number 4 remains unidentified. This species opened its bloooms on the first of two scapes within one day of *A. nelsonii.* One very distinctive feature of species number 4 is that the style extends beyond the tip of the bud (½-3/4″) just before opening. The 2¾ inch bulb had grown vigorously and made two 25 inch scapes. The umbel is 2-flowered, 4 inches across and 3½ inches long. Posture of the perigone is above the horizontal. There is little or no tube. Throat is pale green shading to greenish white which extends 80-90% of the length of the segments. Red coloration on the tips of the segments is a very irregular, splotched pattern in contrast to the regular markings of *A. nelsonii.* Edges of the segments are somewhat irregular and ruffled. Filaments are white, style white shading to red and the stigma is trifid. A photograph of unidentified species No. 4 is shown in Figure 26.

Species number 4 should be useful to the hybridizer because of its vigorous growth and above-horizontal posture. It was not self fertile.

Nor did it set seed with the pollen of *A. escobaruriae, A. nelsonii* or unidentified species No. 6 (to be described). But I did obtain seed set with the pollen of species No. 4 on *A. escobaruriae.*

In many respcts species number 6 was the most striking of the unidentified species collected by Dr. Cardenas. It rivals or exceeds

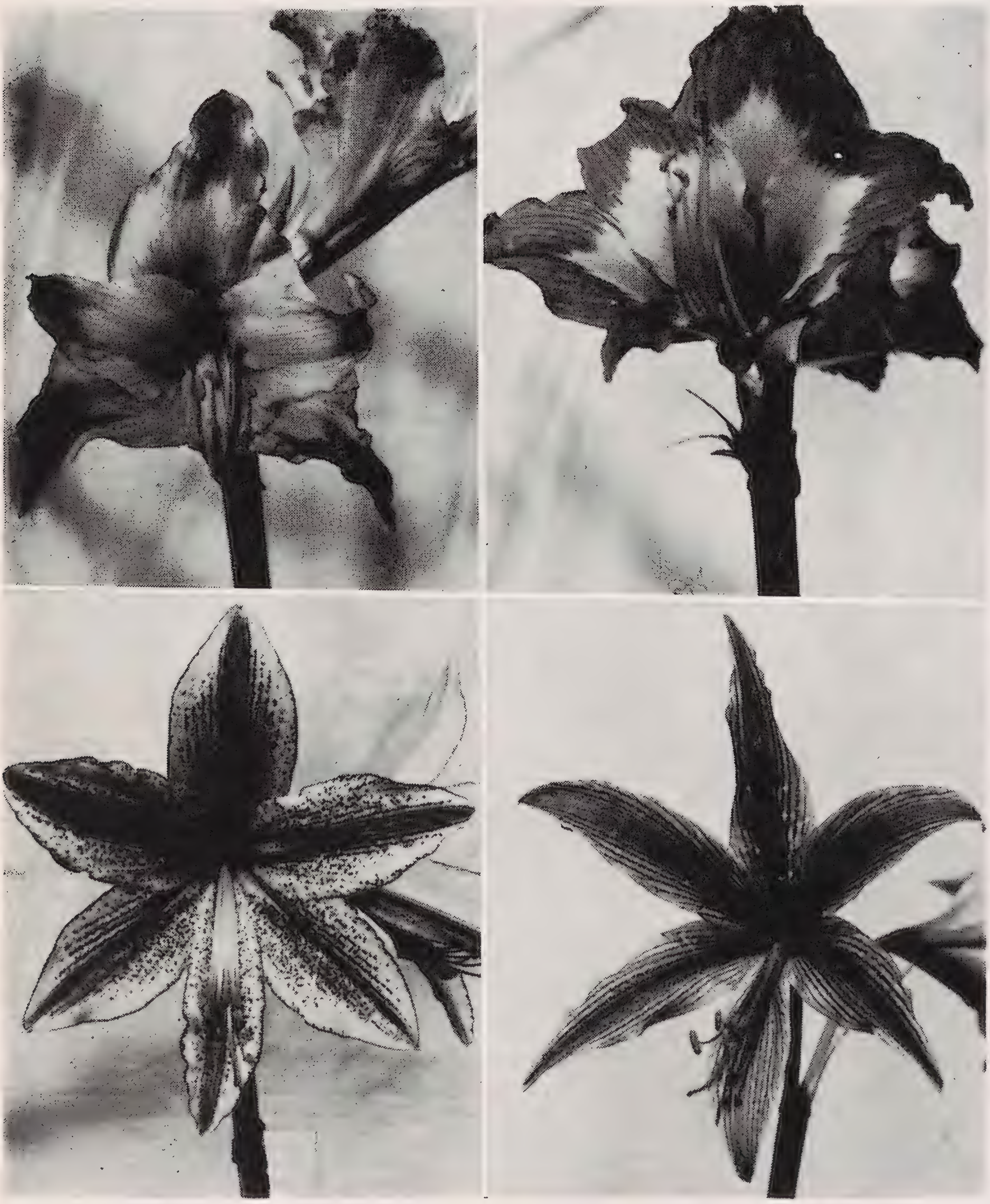

Fig. 26. Upper left, unidentified Amaryllis sp. #4; Upper right, **Amaryllis nelsonii** Card. (sp. #5). Lower left, Unidentified **Amaryllis** sp. #6. Lower right, **Amaryllis pardina** Hook. f. Photos by J. K. Mertzweiller.

A. nelsonii. I consider it closest to *A. pardina* and with some resemblance to *A. pseudopardina.* The bulb is on the small side, about 1½ inches in diameter, and made a single 11 inch scape. The umbel is 2-flowered, perigone 5½ inches across, 4 inches long, tubeless and with flaring form. Throat color is green. Ground color is white, flushed with green near the tips of the segments. Setepalsegs streaked red about ½ inch wide along centerline with somewhat narrower red streaks on petepalsegs. Edges of segments are stitched in red. White ground color of segments is profusely spotted with small red dots. The segments are broader and the bloom is more full that *A. pardina* (Hook.) These differences are easily apparent in Figure 26.

One bloom of the species number 6 was self pollinated and the other pollinated with *A. nelsonii.* Self pollenation was unsuccessful, and the X *A. nelsonii* appeared to be successful but the scape rotted off after about two weeks. I cultured the scape in water and one segment of the pod continued to develop. It reached almost full development and I finally planted a few brown colored seeds and was rewarded for my efforts with two small seedlings. I consider that these seedlings have as parents two of the finest *Amaryllis* species known.

The bulbs of the unidentified species designated numbers 2 and 3 made good growth but did not bloom in 1971. The number 3 bulb has remained dormant most of this spring and summer but is now showing some leaf growth. These are medium size bulbs and it is possible they could be identical to number 6. Mr. Ed Beckham bloomed his number 3 bulb and it was identical to my number 6. Apparently these bulbs may have been accidentally mixed in transit or storage. Bulb number 1 has presented some problems. When first received it was quite soft and required very careful culture. It has hardened, but has put out only a single leaf thus far during the 1971 growing season. The bulb is about one inch in diameter. Based on the appearance of the single leaf I feel quite sure this is *A. viridiflora.* I have previously described (PLANT LIFE, 1968, 1969) the use of frozen pollen of *A. viridiflora,* to set seed on one of my miniature hybrids. These seedlings are now two years old and growing moderately well. The leaf structure of these seedlings bear many similarities to that of unidentified species number 1. Both have narrow leaves, dark green in color and with a pronounced lighter green midrib. Species number 1 has a definite reddish coloration along the side of the leaf near the tip. The *A. viridiflora* seedlings show this coloration to a much lesser extent. Having lost my earlier bulb and with the growth rate of the present plant (species No. 1) it appears that *A. viridiflora* and its seedlings will not be among the easier amaryllis.

Late during the spring of 1971 I had two bloom scapes develop on a bulb of *A.* ''Mrs. Sosa'' which I had obtained from Dr. C. Gomez Ruppel of Mendoza, Argentina. This *Amaryllis* grows well in my area. The two scapes were about 24 inches tall and each was 4-flowered. This trumpet-type is about 6-7 inches long with a tube about four inches long. The bloom is 3½ inches across the face and the segments are quite narrow, about ¾ inch wide. The most noteworthy feature of *A.* ''Mrs. Sosa'' is the color which is very close to the pale cream color of *A. evansiae.* So here is another source of the greenish-cream-yellow color in amaryllis, and in a trumpet flowering species. I was unable to set seed by selfing *A.* ''Mrs. Sosa''. I did obtain seed set with the following pollen parents: *A. vitatta* (var. tweediana), *A. elegans* and ''Marie Goretti''. Although only two seeds from the latter germinated I consider these very promising towards the objective of large flowered yellow hybrids.

Finally I would like to offer a few comments regarding my experiences in growing the *Amaryllis* species, particularly the less common species. It is always a great disappointment to witness the demise of a beautiful *Amaryllis* species that was obtained through great effort, generally on the part of an unheralded collector, and grown with all the care one can command. At the same time other species thrive and prosper. The simple fact is *not all of the Amaryllis species will thrive in any given location.* This is true in South America and it is true in the United States. Variations in climatic conditions are probably the principal reason for variations in performance of the species. *Amaryllis* native to the higher, cooler altitudes of South America are not at home in the hot humid climate of south Louisiana. *Amaryllis* native to the humid lower altitudes and even rain-forest conditions do quite well for us. Among those species which have failed for me are *A. umabisiana, A. mollevilquensis* and *A. elegans* (varieties Divifrancisi and Ambigua). *A. fosteri* and *A. maracasa* are barely holding on and I am afraid will never make blooming size. *A. cybister, A. pseudopardina* and *A. aglaiae* grow fairly well but are having difficulty making blooming size. *A. starkii* grows well but is a shy bloomer. Among the best growers and bloomers we can include most varieties of *A. aulica, A. pardina, A. yungacensis, A. forgetii, A. psittacina, A. escobaruriae, A. belladonna, A. evansiae, A. striata, A. flammigera, A. vitatta* and *A. fragrantissima.* So there is much challenge and also a bit of heartbreak in growing and hybridizing with *Amaryllis* species. But it is well worth the trouble when one witnesses the first bloom of a beautiful new species such as *A. nelsonii* and the other as yet unidentified species collected by Dr. Cardenas. In this respect the 1971 *Amaryllis* season was a very good one for me.

4. AMARYLLID CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

SOME CULTURAL REQUIREMENTS OF **AMARYLLIS** SPECIES

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To write an article of this kind is very difficult because technical information is often non-existent and observations of the collector are not conclusive. A wild plant may not be growing in the conditions it prefers, but is only existing in its indigenous environment.

A. aglaiae is reported to be found from 22°S to 28°S latitude on the eastern slop of the Andes between 65° and 66° W longitude. The colony to be discussed occurs at Los Azucenas at Km. 38 on the road between Acheral and Tafí de Valle at an altitude of 5000 feet. In Rio Sosa Canyon the temperatures are mild the year round, and there is rain every month except one. Amaryllis bloom around the last of October to the first of November. The prevailing wind comes up the canyon. It can be assumed that the humidity is always high. At blooming time the weed growth is only an inch or two high but later the weeds protect the plant.

Experience has shown that if planted in the normal, shallow manner *A. aglaiae* splits up into small bulbs which do not prosper. It is always found naturally with top of bulb about five inches below surface of soil. Experimental planting in tile pipe 6″ i.d. X 14″ long stopped the splitting and gave good growth.

A. striata, as observed growing in the Cerro do Mar of southeastern Brazil at 2500-3000 feet elevation, was growing in a cool moist area that receives 150 inches of rain per year. There is little diurnal temperature change. The area receives an occasional frost in winter. The soil is acid red clay. The plants grew in areas of open shade to full sun. Plants in open shade had very long leaves (100 cm) and correspondingly long scapes.

A. aulica has been found growing in the ground, in the crotches of trees and swinging on vines suspended between trees. It has a range of large area in a climate that touches the freezing point and is never very hot. This area has periods of drought but is usually quite moist. The soil is very infertile and acid. Is of easy culture in pots.

A. corriensis is found in the mountains west of Rio de Janerio at about 5000 ft. altitude, there are occasional freezing mornings here. The climate is moist with heavy rainfall in the summer months and drier in the winter months. It defeats mankinds efforts toward extinction by growing only on inaccessible cliffs where there is little or no soil, but the roots are covered with a fluffy moss. These rock faces are wet daily by fog condensation. It grows easily in pot culture.

A. belladonna is found in many places with some variation in climate but always in a warm region with rain throughout the year. Some varieties (or types) appear to resent pot culture and decline or rot. Sometimes sand or sphagnum pads under the bulb help. However, this species, although evergreen, needs a yearly rest period for a couple of months, letting the soil dry out with only enough water to maintain a slightly moist condition in bottom of pot. If they don't grow vigorously they should be heat treated per instructions on page 178, THE AMARYLLIS MANUAL (TRAUB). They require less fertilization than other species.

A. reticulata is found in eastern Brazil from Sao Paulo to near the Espirito Santo- Bahia border, growing in moist, cool, shady conditions. Our experience has been to give it shade in the greenhouse by tucking it under other plants and to grow it in nearly pure fine sand with heavy watering and very little fertilizing. *A. bluminavia* although found much farther south seems to like similiar conditions.

A. petiolata is found along the Bolivian-Argentine border and again in Misiones Province of Argentina. I found it also in the Parana river basin about 100 miles north of the Argentine border. It grows in acid, tropical red clay where there is plenty of summer rain. In pot culture it requires a winter rest with water withheld—only enough to maintain slight moisture in bottom of pot.

A. calyptrata is found along with *A. striata* and *A. corriensis* in Brazil and is a good pot plant, a very rapid grower, requiring more than usual amounts of water, but has a tendency to suddenly go into decline. When this is observed heat treatment and warm growing conditions restore it to vigorous growth again.

A. fosteri is found in eastern Brazil 13° S lat. and 40° W in a near desert where only spring rain occurs. It is a hot area. Experience with this species is limited. It seems to require hot growing conditions but requires some kind of triggering to initiate growth. I believe a rest at 60°—70°F with dryness is required.

A. parodii and *A. argentina* occur in northern Argentina with *A. parodii* near 2000′ elevation along the eastern edge of the Andes and *A. argentinum* from 4500 - 7000′ elevation. This area has good soil although very rocky. It is an area of spring rain and long periods of drought. Very cold weather occurs during part of dry season. The plant has a very short growth period and remains dormant for several months. Because of the short period of growth all the leaves emerge at once and as soon as they are nearly developed the plant blooms. To successfully grow and bloom these, they should be kept dry for at least three months. They respond to large pots.

Many of the Bolivian species grow in nearly the same conditions. These are *yungacinsis, pardina, lapasense, escobaruriae, leopoldi,* and *nelsoni,* which grow at altitudes between 2000 and 6000 feet, on steep slopes with shallow soil in either brushy or lightly forested terrain, usually covered with a litter of rocks, twigs and leaves. When collected it is very noticeable that the bulb is easily picked up but has roots spread in all directions over 3 ft. long. These are all of easy culture but like large pots and some fertilizer. The growth conditions of *mandonii* are noted in the article describing our trip in 1970.

A. evansiae comes from a warm area between 1500-2000 ft. altitude which gets seasonal rain, but is a near desert area. It often gives trouble in pots because it must have a dry rest period and should be given but little water during blooming, then until new roots and leaves form should receive careful watering. After leaves are well started it likes to be kept moist. I prefer to grow it in a basket the size of a 4″ pot or a 4″ pot with 4 large holes in it. The pot or basket contains only fine sand. In the spring after bloom it is plunged into a 7″ pot of ½ sponge-rok and ½ a mixture of leaf mold and manure. In late fall the 7″ pot is removed and as the mix dries it sloughs away leaving the bulbs in a pot of sand.

In growing seedlings I have found the place to accelerate growth is in the first few months of the plant's life. I prefer to start seed on water, moving them into 2¼ rose liners as soon as leaves are ½ to 1″ long. A rose liner is about an inch deeper than a corresponding sized pot. Four seedlings are placed in the corners of each pot. As soon as a leaf is 3″ long (about 2 months) they are transplanted to a 6″ pot (still 4 seedlings together). The mix for the 6″ pot is usually half leaf mold, half fine sand with 8 pounds of Mag Amp per yard added. The rose liners are always watered with a solution containing 90 p.p.M. N 36 p.p.M. P_2O_5, 72 p.p.M. K_2O, all nitrogen in nitrate form. At the end of a year most bulbs are 1½″ dia. Some plants like *A evansiae* and its bybrids bloom in 16 to 22 months.

AN AMATEUR'S NOTES ON GROWING AMARYLLIS

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It should be clearly understood that the information given is my own opinion and experience in growing amaryllis for the past twelve years or so. My experiences cover both growing in the open and greenhouse culture. I have been very fortunate in meeting many fine individuals and through the years feel I have obtained much valuable information on growing amaryllis that I hope will be of some value to those interested in pursuing this very interesting hobby.

Before one can successfully grow amaryllis, one has to provide the right growing environment (proper soil conditions, fertility, etc.) regardless of whether the bulb is to be grown in pots or outdoors. Following you will find my observations on growing amaryllis in the open.

What are the ideal soil conditions? Well, I believe that an excellent mix can consist of leaf mold, well rotted manure and coarse builders' sand in the following proportions: two parts leaf mold, two parts rotted manure and one to one and one-half parts sand. In open culture, these materials should be tilled in (with a tiller, if available) to a depth of approximately twelve inches in a well drained area or in artifically raised beds on top of the soil in less well drained areas. Amaryllis bulbs should be grown in elevated beds approximately six to eight inches above the surrounding surface. Such beds should be located in semi-shaded areas which receive three-fourths sunlight. (Ideal conditions would be under well spaced pine trees.) In addition, a good mulch of bagasse (sugar cane pulp which is sold throughout the world as a poultry litter) should be applied at a depth of four inches before the first freeze. A good substitute can be pine straw or other coarse organic material. This will also protect the bulbs from the sun in the summer as well as help conserve moisture and keep down weeds and grass.

What about a feeding program? Well, this year soil samples from my amaryllis beds were analyzed by the Louisiana State University Soil Testing Laboratory and the results showed that the soil in the beds varied from 6.0 to 6.6 pH, which, according to the literature (Dr. H. P. Traubs' Amaryllis Manual, and also personal communication from Mr. H. J. N. v. Woesik of Ludwig and Company, and others) would be ideal for growing amaryllis. In analyzing the results of my soil it was pointed out that even though the soil had a perfect pH—the available phosphorus, potash, calcium, and other materials were far in excess of a plant's requirements. This would indicate that indiscriminate use of such commercial fertilizers should be avoided. For to do so would raise the phosphorus content of the soil to such a high level that the iron in the soil would be bound—thus making it (the iron) unavailable for the plants. Now in order to get good growth and green color in amaryllis, under my soil conditions, it was suggested to use small amounts of ammonium sulphate at frequent intervals, at the rate of 1½ ozs./square yard. (Which works out to be at a rate of 300 pounds/acre).—Soil tests every other year can guide one in the use of fertilizers and are recommended.

Others and I in the Baton Rouge area have grown amaryllis under these conditions quite successfully and it is hoped that this outline will be of some help to the average amaryllis grower.

One cannot over emphasize the importance of having the soil analyzed—because your leaf mold and manure may be from certain sources that may have extremely acid or alkaline reactions. Also, fertilizer used properly can be a blessing—used improperly, it can be a disaster. Hence, be cautious in the use of commercial fertilizers.

Although insects and diseases can become limiting under some conditions, their control is not too difficult and it is not dealt with here, since proper soil conditions are, in my opinion, the chief limiting factor in amaryllis growing in the Baton Rouge area.

Growing amaryllis in greenhouses really requires much more consideration and I know of no one to date who has found the perfect formula. I have been fairly successful in using a mixture of leaf mold—

organic material and rotted manure—a little sand, bone meal and perhaps a small amount of ground oyster shells. A good liquid feeding every several months should be applied. I have used several to good advantage. I would recommend a 5-10-15 or 5-10-10. Manure water to the color of tea is very good as an alternate feeding. Most important is a soil that will drain well and permit the roots to penetrate to the bottom of the pot.

Recently I have found a very good source of material to use to grow seedlings. Dr. E. N. O'Rourke, who has had some twenty years experience in this field, passed the information on to me. A mixture of the following—Perlite, Turface, Redi Earth or Jiffy Mix (1 part each), add about 10% organic material such as cow manure. (This can be secured from local nurserymen. Remember the material needs a good application of liquid fertilizer and perhaps a drench of Terraclor and Dexon would be advisable to avoid damp-off, etc. This would especially hold true for young seedlings. Feed your young seedlings with a 20-20-20 liquid fertilizer about every two or three weeks.

Two years ago I wrote to Dr. E. N. O'Rourke, Professor of Horticulture, asking that some research on amaryllis propagation and disease control be instigated at L.S.U. This was discussed with Dr. Don Newsom, Head of the Department of Horticulture (L.S.U). and work on this project was begun. Following is a report by Dr. O'Rourke on what has been done to date: (1970)

1. *Disease Control Study. Mosaic.*

A. Determination of heat tolerance of bulbs (thermal death point).

Heat treatment can be used to rid plants of some virus diseases. In order for this to work, the virus must be killed by a considerably lower temperature than that tolerated by the host plant. Most mosaic in amaryllis appears to be caused by the cucumber mosaic virus called CMV. A number of strains or types of CMV exist, some affecting certain plants but not others, differing in their virulence to certain host plants and in their tolerance to heat.

Evidence to date shows CMV strains killed by 10 minute exposures to temperatures in the range of 55-60°C. (Higher?) This is unfortunately high. There is, however, no published evidence on the tolerance to temperatures in this range of amaryllis bulbs. Tolerance can be affected by the duration of exposure, the rate of heating and cooling, the temperature level and possibly by the initial heat of the plant and its growing state (whether active or dormant). Dry heat may have a different effect than wet heat.

The size of massive structures such as bulbs is important in heat treatment, since the outer parts must endure longer exposures than the interior in any exposure that raises the interior to a given level. The time is less with smaller bulbs, and their survival to a given period of exposure may be better than that of larger bulbs.

A study of the effects of some of these factors is now underway. A water bath with thermostatically controlled heat and water stirrer is being used in the wet heat studies. A recording device allows the study of temperature changes within the bulbs by means of small thermocouples inserted into the tissues at various depths.

To date, actively growing bulbs sized into six categories from ½ inch to 2½ inches in diameter have been heated until the centers were kept for ten minutes at 60°C. (140°F), 55°C. (131°F), and 50°C (122°F). The 60°C exposure killed all bulbs. All survived the lower temperature.

We will now narrow the temperature range to study the exact killing point for bulbs under actively growing conditions. Once this is determined, we will determine its effect on dormant bulbs and attempt to increase survival at the highest temperature possible in order to study the effects on the mosaic symptoms.

Dry heat, in an oven rather than a water bath, will be used in a similar study to determine if survival follows a different pattern.

2. Amaryllis propagation study:

Bulb cuttage, in particular the technique known as the ''fractional scale-stem'' method, is the chief means of increase of clones of amaryllis. It is largely practiced however, by the professional growers and shunned by amateurs because of their fear of losing the bulb they wish to increase.

In this method, the bulb is sectioned vertically into slices like orange segments. These slices are then cut horizontally across the stem portion to obtain small wedges of stem, each with one or two leaf base parts attached. These small divisions are then placed in a moist, well-aerated medium and in time each produces one or several bulblets.

Sanitation is important, since the cut tissues are quite vulnerable to a host of rot organisms. Certain fungicides and possibly bactericides are used by large commercial growers, but they do not divulge this information.

There are a number of points involved in amaryllis cuttage that deserve more study. The effects of such factors as heredity, dormancy and size of bulb, size of cuttings, after-cuttage treatment for disease prevention, growth substances such as auxins, gibberellins, and kinins, light temperature and medium deserve attention.

Mr. Ibrahim Yusof, currently pursuing studies toward a Ph.D. degree in the Horticulture Department at L.S.U., is beginning a series of studies to obtain more information about such relationships. He has completed a review of much of the pertinent literature and has assembled some of the materials. He will begin his experiments this month (May, 1971). You will be informed as information is ready for release on this project.

In closing, I would like to thank many very fine persons who have helped me so much in growing and hybridizing amaryllis, a hobby I dearly love.

Mr. Ted Tower has been instrumental in securing various amaryllis species from a friend, Fred Caulfield, a Methodist missionary in Bolivia —yellow (perhaps Evansiae), reds, pinks, etc. and some seed from what they described as a pure white. We have crossed these with the best Dutch clones. Mr. Henry van Woesik was responsible for the very fine Dutch clones, some of which are still in the number stages and will not be released for some time. I have used many in crosses. Mr. Clarence Crochet, a hybridizer who has some very fine amaryllis, Dr. Joe Mertzweiler and Dr. Fred Buchmann (now deceased) are responsible for my interest in species, and Mr. Claude Davis, a very close friend (now deceased) is one who has contributed much to amaryllis culture. Mrs. T. K. McKnight, a local hybridizer who has many fine clones of Dutch X Mead crosses. Dr. Ira Nelson (deceased) whose name appears so many times on my tags, has helped me with various crosses. Also, Mr. Charles Ramelli, Biloxi, Mississippi, who has been so generous and has so many fine amaryllis crosses, including several fine doubles. Dr. Fred Schmitz, Plaquemine Parish, of whom I know you have heard so many favorable reports, especially in connection with those amaryllis so adaptable to outdoor culture. Many others have given me much encouragement and help. Among these are Mr. Frank Haight and members of the Baton Rouge Amaryllis Society and many friends in the New Orleans Men's Amaryllis Club.

I mention these fine people with the thought that, after all, a fine flower cannot be enjoyed unless it is shared with others and they should be remembered for the help given.

I hope the information will be of some help and if you have a beautiful bloom, please give me the privilege to see it.

GROWING RAIN LILIES IN GALVESTON

Mrs. David E. Wilson,
2719 Palm Circle West, Galveston, Texas 77550

My father, the late Morris Clint, started my gardening interest in rain lilies (*Zephyranthes* and *Habranthus*) with about a dozen different species. We were living in Houston at the time and the bulbs were planted helter-skelter in groups around our wide back yard. Their blooms were always a bonus, for they required little care and multiplied rapidly. When we moved to Galveston, we found that land for newer homes was at a premium and our new gardening area quite small. For this reason, plus the fact that my gardening time was limited, my Houston rain lilies and a few hybrid *Amaryllis* were the only bulbs I transferred.

There were enough rain lilies to plant a border in front of rose bushes, alternating colors and blooming time for balance. Between the sandy loam soil and more dependable rainfall, they immediately put on a flower show. My mother visited us later and was so impressed with performance that she sent additional species for a greater variety of color and season. A few of her plant friends were also generous with both bulbs and helpful growing tips. Once my border of *Zephyranthes* and *Habranthus* was established, I began experimenting with other small bulbs to prolong the season or add a change of color. I had to discard *Oxalis* because they needed more confinement. *Lycoris radiata* is a pleasant color change in the fall and the leaves are dormant when the rain lilies are most active. Because the blooms last so long and there is a variety of blooming time among species, the *Allium* species will probably be the best for my purposes. At the present time I grow only a pretty color form of *Allium mobilense.* All of the ''odd'' bulbs are planted in front of the rain lilies so they won't be disturbed when dormant. The *Allium* will even grow between rocks. Any number of small bulbs could be used in this manner as long as foliage and flowers are in proportion to the border and the growing requirements similar

Rain lilies are also nice in pots (which can be more easily protected from cold). Because of space, I grow only the more rare or difficult species this way. For pure beauty and enjoyment, however, some of the dainty bulbs are excellent. *Zephyranthes rosea, albiella, insularum* and *miradorensis* are just a few of the named species that are well suited for this purpose. Just for fun, I also grow a few bulbs along with *Cycads* in large pots. They are perfectly compatible as long as there is room for bloom to show. Both the *Zephyranthes* and *Habranthus* like good drainage and it was my parents' practice to add pebbles to the soil mix and to the top of the pot. This requires more frequent watering, but is worth it. My greatest difficulty is local water quality. I store rain water in plastic garbage cans and use this exclusively for the pot plants.

Galveston is one of the oldest cities in Texas and the gardens and wild flowers are colorful almost all year. Right after we moved to the Island, our daughter found a pretty white *Cooperia* growing in a vacant lot next door. Jamie was only three at the time and she was so proud to find ''a flower like the ones in the back yard.'' I sent plant material to Brownsville and my mother identified it as *Z. traubii.* Subsequently, *Z. traubii* was noticed in a few other vacant lots around town and along the high shoulder of a road toward the west end of the Island. Colonies are usually small, contained, and may be some distance apart. There is variation in flower size with the local *Z. traubii* and it blooms repeatedly from June through the fall, sometimes as late as December. Strangely, these bulbs grown in the garden do not set seed as readily as in the wild. Another *Cooperia (Z. brazosensis)* is sometimes found growing with *Z. traubii,* or alone in filled areas. *Allium mobilense* (identified by Dr. Thad Howard) was also found growing next door in three color forms: purple, pale purple and white. The only other place I have noticed this in bloom is near the airport. Whether this latter area was filled at one time I do not know.

After the 1900 Hurricane, the first part of a 17-foot sea wall was built and the east end of the Island was elevated with the salty sand and clay from dredging of the harbor. This ''grade raising'', as it was called, filled many basements and almost all vegetation was either removed or covered. As the city grew westward, a grade standard was maintained that required a certain amount of fill for each new section.

While some basic fill presently comes from parts of the Island, the best top soil has always come from the mainland (Galveston and Brazoria counties). This may explain the possible introduction of many plants now native, including the ones mentioned earlier.

In my travels about town I have also noticed several other *Zephyranthes* species that have ''escaped'' from their original gardens. Among these are *Z. drummondii (C. pedunculata), Z. grandiflora* and *Z. candida.* These vigorous bulbs thrive even with regular mowing of grass. I have attempted to produce my own ''natural'' garden by discarding ripe seed capsules in the grass, but after several years only a few seedlings are evident.

Rain lilies in the ground are almost maintenance-free in this area. With a few exceptions, they like a sunny, well drained spot that receives each rain shower. With sandy soil, an annual mulching with humus is helpful, along with a light feeding of a balanced fertilizer every six weeks or so. I have often been negligent about the latter, but they seem to bloom as usual. When my border ''crop'' grew beyond the dozen or so plant names I had memorized, I faced a problem with labeling. I used an inexpensive stickon-tape labelmaker for one side of the white plastic label and used a #1 pencil to mark on the reverse side. As added insurance, I marked a chart as I planted new material and buried the label in front of the particular clone. This last precaution is necessary because of curious youngsters. Time will tell, but after several years in the ground the labels are like new. The one annoyance is removing all seed capsules as they form. Winters are usually mild in the Galveston area, so hardiness has not been a problem.

At one time I thought the rain lilies attracted few pests. However, we occasionally have a bumper crop of large snails and both night and day feeding cut worms. I find chemical and bait eradication slow at best and often remove them by hand at dark when they come out to feed on the succulent leaves and buds. My pot plants are elevated and are rarely bothered. An occasional mealy bug appears on these plants and it may also be controlled by hand.

The genus *Zephyranthes* (including subgenus *Cooperia*) is particularly large with named species, available unnamed species or variations, and the growing number of lovely hybrids. The *Habranthus* are more limited in number and some are difficult to bloom, especially the Mexican species. I kept ''score'' on my bulbs for a season and each one listed below bloomed a minimum of three times. Some on the minimum bloom scale are listed because of season, unusual color or other personality factor. These may not suit every area and can be affected by rainfall patterns in a given season. Any omission of a particularly vigorous clone (mainly unnamed species) is due to insufficient experience. The numbers listed at the top of the next page indicate approximate blooming period.

(1) April-May (2) June-July (3) Aug.-Oct.

NAMED SPECIES

Pink-Rose Red

Z. morrisclintii (1)
H. robustus (1, 2)
Z. clintiae (1, 3)
***H. martinezii** (2)
Z. grandiflora (2, 3)
H. brachyandrus (2, 3)
Z. macrosiphon (2, 3)
Z. lindleyana (2, 3)
Z. rosea (3)

Gold-Lt. Yellow

Z. howardii (1, 2)
Z. citrina (2, 3)
Z. pulchella (2, 3)
Z. smallii (2, 3)
Z. refugiensis (3)

Cream-White

Z. drummondii (1)
H. cardenasiana (1, 2)
Z. albiella (1, 2, 3)
Z. insularum (2, 3)
Z. traubii (2, 3)
Z. candida (3)

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* I have been growing this clone as H. sp. Korsakoff 1199 and he recently wrote that it will be or has been published as **H. martinezii.**

The fact that a plant species has not been published does not detract from its performance in the garden. Listed below are just a few of the unnamed Mexican *Zephyranthes* that are generally available. These are easy to grow and bloom frequently.

UNNAMED SPECIES

Z. sp. Horsetail Falls (1) (Howard 62-1)
Z. sp. San Luis Potosi (Korsakoff 484) (1, 2)
Z. sp. Mrs. Strout's (2) (Large Rose)
Z. sp. Tamazunchale (3) (Clint M-375)
Z. sp. Jacala Yellow (3) (Clint M-449)
Z. sp. Jacala Bicolor (2, 3) (Clint M-618)
Z. sp. El Naranjo (2, 3) (Clint M-550)

While hybrids will never replace some of the most outstanding rain lily species, they certainly are an asset in the garden for unusual color, size, repeat bloom, vigor, etc. My experience is limited, but I've had some great surprises from a sampling of both old and new varieties. As an example. *X H. floryii (H. brachyandrus X H. robustus)* is intermediate in appearance, starts blooming with *H. robustus* and continues to bloom until late fall. It multiplies nicely in the ground and the blooms last well.

A DELIGHTFUL SUBJECT: **LEUCOCORYNE IXIOIDES ODORATA**

Charles Hardman, *P. O. Box 938,*
Temple City, Calif. 91780

The genus *Leucocoryne* contains several species which are worth more than casual interest by the collectors of Amaryllids One of these is *L. ixioides,* and especially its variety, ''odorata''. I grew this for the first time in 1971. Now that I have seen it bloom, I am frankly at a loss to explain why it is not more widely grown.

It appears that the species was first introduced into the United States from Chile, early in the 1930's. Several years of publicity resulted in widespread popularity so that nurseries stocked it and sold the bulbs at a brisk rate. For some reason, the boom in this delightful subject died out, and it is now difficult to find bulbs. Specialty nurseries sometimes do have them for sale, however, and they are well worth the small price usually asked.

The bulbs seem to take crowding well, and it is by putting a group of them into a three- or four-inch pot that the best effect is obtained. Don't expect growth right away. In this respect they are a little frustrating, for they frequently dawdle along for several months after planting before showing any growth. On the other hand, they *may* come up within a month. Either way, the bulbs won't bloom until they're good and ready. But the flowers are well worth the initial wait.

The leaves are thread-like and hardly seem capable of providing sufficient nourishment for the bulbs let alone the remarkably vigorous flower spike which emerges from them. This grows to a height of from 12 to 15 inches and is quite strong in spite of its fineness.

I dislike putting myself out on an unscientific limb, but I suspect—no proof is at hand as yet—that the flower stem, once having bloomed, may have a role to play in producing food for the growing bulb, as it remains green and healthy long after the flowers are gone even when no seed pods are forming. I have noticed similar behavior displayed in other bulbous plants. A group of bulbs of a *Cyranthus* I have (species as yet undetermined) provides a case in point. The plants still retain vigorous, living flower stalks, although it has been more than three months since they bloomed and no seed is forming. I believe this green stem may serve as a supplemental food factory to the narrow leaves, acting as an ''additional'' leaf. But I repeat, this is entirely speculation on my part and I have never seen the idea confirmed.

Last year, several forms appeared within my group of twenty-five bulbs. The name ''*odorata*'' evidently signifies a seed propagated variety rather than a clonally propagated one. One form was quite dark in color, really more of a purple than the usual lavender-blue. This one had narrow segments and the flower appeared a bit smaller than most of the others. Three plants displayed flowers with wide segments and very blue color. Most of the rest showed segments of average width and the common lavender-blue flowers.

Each of these flowers exhibits a startling white star in its center, and a cluster of three yellow pseudo-stamens protruding from this star quite boldly, all of which adds greatly to the interest of the blooms which are about two inches across.

The fragrance of this *Leucocoryne* has become a legend; it is at once powerful, yet hauntingly lovely. For me, the scent is of sweet licorice with overtones of coffee or chocolate. This fragrance is particularly in evidence at night, a fact which was overlooked or considered unimportant by the individual who gave the plant its dramatic common name: ''Glory of the Sun''.

Arrangers would do well to become acquainted with this gem; for cut-flower use the blooms are splendid. Each flower remains bright and cheerful for over a week when left on the plant, and freshness lasts at least five or six days when the flowers are cut. They add greatly to certain arrangements.

Hybridizing is an easy task, but the flowers must be destroyed in order to get to the anthers and pistil, as these are set deep within the flower's throat. Seed production is scant.

I would like to see a tetraploid form of this fine subject developed. With this objective in mind, I intend to begin work at once.

EXPERIENCES WITH AMARYLLIDS, 1970

Richard E. Tisch,
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General. This year was a continuation of last year in more than the standard progression of the seasons. The faster maturation of plants in plastic pots continued to be demonstrated by most of the age groups, so all plants were finally transferred out of clay pots—either to outdoor beds to check their garden hardiness, or on up to square plastic pots or plastic juice pitchers. It seemed, additionally, that there was less damage from insects and diseases. The use of plastic pans for seedlings again proved optimum for my space and handling practices. Weather conditions were adverse for most of the specimens, alternating from unseasonable heat and bright sunshine when overcast and rain would normally prevail, to sudden plunges into downright chilly and clammy days and nights, followed by a stretch of bone dry hot winds and scorching sunlight. I marvelled that most of the plants survived in good health, even though their flowering and leafing-out stages were stressed to extremes.

Amaryllis hybrids. The number one happy day was a brilliant and balmy morning when an extra-large flower opened outside at one end of the family room picture window: pure pink, with absolutely no green inside, head up, and eight petals! There were two sets of balanced segs, four in a set. There were four long stamens and four shorter stamens. The stigma was four-lobed, and the ovary was four-celled, square. Of course it was pampered and protected, but something got to it regardless and chewed a great hole in the scape, where disease started and where it eventually folded over before seeds could develop far enough to be saved. But pollen from this plant was used generously, and strong seedlings are growing healthily in a protected plastic pan under a clear plastic cover. It was crossed onto the strongest large red, onto a small orange-red, and onto a deep burgundy red; only the large red has green inside the petals. The second flower had the normal flower, so the doubling or squaring (?) is apparently not characteristic of the plant as a whole. The plant is one from a batch of seedlings which had been treated with colchicine prior to sowing. So far as the coming seedlings are concerned, the next four years will include some impatient watching and fussing until they flower.

The large red flower upon which the aforementioned cross was made has been an excellent seed parent, not alone because it sets seed readily and passes along strength and early maturation, but also because it is recurrent blooming. During 1969 to 27 July 1971 it flowered ten times! Its earliest flower came on 21 March, its latest on 14 November.

Allium unifolium. This pleasing little flower seems to have made itself at home in the shade of an Olive tree in our back yard. Each April it sends up its slender scapes with pink umbels, sets seed and goes dormant by early July. Crosses resulted in seed, but no known progeny exist yet.

Brodiaea pulchella. From a visit to an historical location north of here in April 1970 I brought home some bulbs of this little beauty. It is shown in the very fine ''Wild Flowers of the United States'' publication of the New York Botanical Garden, Volume Four, ''The Southwestern States''. The ones I brought back were slightly more on the bluish side than are those shown in this excellent color reproduction. They have not flourished here, nor have any seed germinated. I intend to try again because of their grace and neatness of form.

Habranthus and *Zephyranthes.* These pretty little pixies have to be watched carefully; again this year some have popped up and flowered before I was aware of the presence of their fast-growing scapes. However an early morning prowl resulted in the detection of some *H. andersonii* that were ready to open. My notes show that I pried them open and removed the anthers at 6:30 AM and that the anthers were open by 7:15 AM. Also, I deanthered a *Z. drummondi* just this afternoon, but I'm convinced that the scape was not evident yesterday morning when I examined the coldframe. One of the *H. andersonii* seedlings flowered in two years, indicating that changes may come about faster than in some of the others which take several years to mature.

Hemerocallis. One of the seedlings from a standard commercial clone has stayed dwarf, being 20 cm high. It has divided into two small plants, one of which had a rather ordinary flower at leaf top height. This may become a plant useful for edging in this area, or for use along the top of a low wall. It is one from a batch of seeds treated with colchicine prior to sowing.

Caloscordum neriniflorum. This flowered for the first time last year, but I thought it was surely immature: its umbel resembled a cluster of pink match heads and its scape was so slender and weak that it had to be propped up with little bamboo hibachi spears. This year it produced the same kind of scape and umbel, so I removed it from the shelter of the coldframe where it may have been too shaded and planted the onion set sized bulbs in full sunlight. Next year we'll see what they do.

Rhodophiala x huntiana. After excellent leaf growth to 15 cm, and a period of dormancy in late summer, up came some sturdy little flowers of deep ox blood red which changed to a glowing burgundy. Some bizarre crosses which were tried were rejected; I'll try again this Fall. They will apparently make a satisfactory edging plant, in morning sun.

Miscellaneous comments. With all the experimenting that is going on around me, I still find pleasure in growing the untouched species which have seen no alterations to their heritage other than that which has occurred in their native habitat. *Amaryllis striata* continues to send up its apricot flowers on graceful scapes, amidst rich green arching leaves. at almost any time of the year. *Brunsvigia rosea* continues to mark the advent of middle July with the brave tips which push up out of the hard dry soil, to flower in late July and early August; its pink tones and sweet fragrance are indeed welcome at that time of year. *Tulbaghia violacea* forms clumps of continuously flowering slender scapes with graceful violet umbels from late Spring to early Winter. I often wonder why I should be trying to change happily adapted flowers such as these.

NERINE COMMITTEE REPORT, 1971

Charles Hardman, *Chairman, Nerine Committee,*
Box 936, Temple City, California 91780

The hobby of hybridizing ornamental plants has reached such levels of intensity throughout the world, that it is safe to say no major genus has been left untouched by the backyard gene mixers. Yet certain genera, deserving of wider popularity among hybridizers, have gone begging for lack of intensive work by more than a handful of people. Many subjects which merit serious consideration by amateurs and professionals alike, are ripe and ready for building on the scant work already done. One of these is the genus *Nerine.*

I use the term ''scant work'' with the full knowledge that I will be taken to task for it. The early work of H. J. Elwes which was begun in the 1800's, the later work of E. de Rothschild earlier in this century, and the work currently being done throughout the world—which is not meant to omit Barr, Clarke, and a good many others along the way who certainly should be given credit for their contributions—cannot be written off lightly. And I am not trying to do so.

Yet, compared to Iris, Gladiolus, Daylilies, Dahlias, Chrysanthemums, Roses, and even Amaryllis themselves, it must be admitted that the work which has been carried out thus far on Nerines has been anything but exhaustive.

While the bolder cousins of the Nerines have held the spotlight for so many years, this genus has been assigned an occasional walk-on role, usually in crowd scenes at the far end of flower shows. Certainly the popular demand for flowers of large size impeded the progress of Nerines during the era we are currently leaving behind. There is little doubt that floral charm and grace and elegance—all attributes Nerines have in abundance—were often sacrificed in an atmosphere that equated large size with quality. In England and Continental Europe, small flowers have always been admired and grown in abundance.

This favorable state of affairs is gradually making inroads into other cultures as they mature and become willing to admit qualities which have been overlooked or even brushed aside before.

At the moment, the future for Nerines looks brighter than it has for a long time. What appears to be a major breakthrough in collecting, growing, and hybridizing is just now gathering a head of steam.

In England, for instance, the Nerine Society, in existence for only four years, already could boast a membership of 235 by the end of 1970. These members represent eleven countries.

Correspondence with the Honorable Secretary of the Nerine Society revealed some surprising facts. On April 28th, 1971, C. A. Norris of Worcestershire, England, wrote me: ''I have just returned from a six weeks trip to South Africa, where I have been collecting Nerine bulbs and meeting people interested in the genus. Altogether I have picked up bulbs of some 25 species and a number of subspecies. . . . This now brings my collection up to nearly 400 named cultivars . . . and about 30 species.''

Frankly, I was unprepared for that statement of facts, but the comment which followed provided the real surprise: '' I suppose I have one of the biggest collections with about 40,000 (bulbs). . . .'' From the vantage point of my own small collection, one which numbers 40,000 bulbs seems staggering in its proportions even if they are ''. . . mostly the very common and ordinary forms like Corusca Major, N. sarniensis, ''Fothergillii Major'', ''Mansellii'', and ''N. bowdenii. . .''.

In my correspondence with Mr. Norris, I complained of the lack of sources of supply here in America for Nerine bulbs and asked if he could advise of any other parts of the world. The reply I received was this: ''The fact is that this shortage is not limited to America. A friend of mine with a small collection of a few hundred bulbs put in a small advertisement in one of our gardening magazines and sold the lot within a week. There just is no stock anywhere except Borde Hill Gardens, Haywards Heath, Sussex, . . .''. Mr. Norris is very nearly correct in this. It is a state of affairs I hope to see adjusted with the advent of a large crop of enthusiasts.

One enthusiast I met for the first time during the 1971 season is Roger Boddaert. He is a young man who has a refreshing attitude: he does things instead of merely talking about doing things. I was fortunate in being able to see his Nerine collection while some of the prettier varieties were blooming. This was a revelation in itself. But that was not the end of it. Hearing Roger talk about Nerines could make an enthusiast out of all but the most hardened gardener. The man is that rare combination of poet/scientist/hard worker so badly needed and yet so badly lacking in today's society. My understanding is that Roger will be having a few bulbs for sale occasionally. What is more, he intends to do as much hybridizing within the genus as time will allow.

Of course, when anyone speaks of Nerines in general and American

Nerines in particular, the name of Mrs. Emma Menninger has to be brought into the conversation at once. This fine lady has been hybridizing Nerines for over twenty years now. To view her collection in bloom is an experience which ranks with those other few experiences in a gardener's life that can be said to be high points. Spectacular as the blooms are when seen as individuals, there is a lacy grandeur about a mass of blossoming spikes which is almost overpowering in its total effect. Here in Mrs. Menninger's garden are the ballerinas of the Amaryllis family on display in great numbers, exhibiting a graceful elegance unique in the entire plant world.

We learned with sorrow of the passing of Mrs. Menninger's husband this year. Emma's constant companion in her hybridizing work, Elmore Menninger will be sadly missed by the many friends and plant lovers who were always welcomed at the garden gate by his great good cheer.

It is August as I write this, and nearly time for another season of bloom. Along about this time of year, the edge on my anticipation becomes honed pretty fine. I think it's partly due to the fact that Nerines bloom the reverse of so many plants: the icing comes before the cake. Somehow, there is something very satisfying about that procedure for me. Perhaps it's because the growing plants themselves do not disappoint me. The long, green leaves growing out of those plump, brown bulbs provide a source of casual beauty easily overlooked, but well worth a few moment's contemplation from time to time.

This year, a number of imported varieties are being added to my collection. I'm hoping many will bloom so hybridizing can be undertaken and seeds planted right away. It will be three or four years before the results can be judged, of course. But that time will be spent in the same way all other plantsmen spend their time: working with an ever-increasing collection of plants.

During the 1970's and '80's, we can look forward to a great deal of progress. Varieties—both species forms and hybrids—and especially the hybrids—will increase in numbers, colors, forms, and quality. Some breeders are already working with Colchicine, and once a sufficient number of fertile tetraploid forms are available, some wonderful combinations should begin to appear. Recently, certain triploid forms have demonstrated that they are fertile, or even "very fertile" as the information was given to me. Whether the viable seed obtained from these triploid crosses prove to be from true crosses or merely parthenogenetic "crosses" remains to be seen. But the prospects are exciting, with perfection, elusive as ever, always the goal.

Until the perfect Nerines arrive on the scene, however, those of us who grow the less perfect ones will content ourselves with the fine qualities this genus already exhibits. After all, the serious hybridizing work is just beginning on a widespread scale.

NERINE POT CULTURE

The following cultural instructions are furnished with *Nerine* hybrid bulbs offered by Borde Hill Garden, Ltd., Haywards Heath, Sussex, England:

The Nerines are natives of South Africa and belong to the Amaryllis Family. They have given rise to many beautiful hybrids.

As soon as the bulbs show signs of making growth in August or early September, submerge the pots in water for six to eight hours to ensure the soil being uniformly moist, and then give water sparingly until the flower scapes are well advanced from September to November.

After the bulbs have finished flowering, place the pots in an airy sunny situation close to the glass and encourage a free foliage growth by giving a little weak liquid manure. In May, when the foliage commences to turn yellow, gradually cease giving water and allow the bulbs to ripen off in their pots during their dormant period.

Plenty of air and sunshine are their principal requirements, and a minimum temperature of 34 degrees F.

Re-pot when necessary, say every third or fourth year. When potting, put plenty of crocks to ensure good drainage and put in a compost of 4 parts fibrous loam, I part coarse sand and a little dry well-decayed manure with a sprinkling of bone meal, well mixed. If these ingredients are not available, John Innis Compost No. III can be substituted.

Always pot firmly, leaving the upper half of the bulb above the soil.

Nerines are propagated by offsets or by seeds. The latter are best sown when ripe on the surface of the soil.

1971 DAYLILY REPORT

W. QUINN BUCK, *Chairman, Daylily Committee,*
The American Plant Life Society

Based on the growing number of tetraploid registrations made, as well as upon comments from growers and hybridizers all over the country, it seems that the momentum toward a complete shift of interest over to the tetraploid daylily is finally increasing. Interest in hybridizing with tetraploids is very high, and there is surprising activity in actually treating plants and flower spikes with the colchicine techniques described by the pioneers Schreiner, Buck, Traub, Fay, Griesbach, Arisumi, and Lachman.

In 1971 severe drought was prevalent in the Midwest, down into Tennessee, and in most of the Southeastern States. Florida and some of the eastern seaboard states were plagued by severe drought followed by excessive downpours late in the summer. Southern California had severe heat at unusual seasons. In spite of all these natural hindrances most daylily growers were able to get much work done as they enjoyed the flowers that they had.

In this reporter's garden 'Mary Todd' (Fay), in spite of a tendency to fade slightly in the hot sun, holds its place quite firmly as the best midseason tetraploid yellow daylily, based on performance and quality, being unchallenged here by 'Golden Surrey' (Fay), which has been reported most favorably from some areas. The newer very round pale yellow 'Galena Moon' (Blocher), wide petalled 'Bonnie John Seton' (Peck), the heavy substanced, round ('Golden Ring' (Traub), and the stalwart new 'Yellow Crystal' (Griesbach) must develop into larger clumps before they can be compared for performance. The robust large yellows, 'Northbrook Star' (Fay) and the pale 'White Cloud' (Traub), did give much better performances as older and better established plants, The early flowering gold 'Dr. Ned Miller' (Buck), slated for early release, was particularly lovely because of its perfect classical shape and amazing substance.

'Sir Patrick Spens' (Peck) has for several years been the best sunfast red tetraploid, but this year it had competition in a newcomer, 'Lusty Lealand' (Peck), a refreshing bright red with large yellow throat, very sun resistant and a good parent. 'Red Cherry' (Hardy) was a nicely shaped bright red, but it could not take our heat and sun. 'Gypsy Trail' (Griesbach) produced fine spikes of velvety big flowers, which do not hold up in the sun, and which gave only one seed pod. The normally less resistant green-throated 'Arriba' (Griesbach) was inconsistently and surprisingly sun tolerant on some of our hottest days. A small treated plant of 'Congo King' (Lenington) gave interesting crosses which hopefully will carry its deep velvety red.

The electrifying deep rose color of 'Jock Randall' (Peck) stands out as a highlight of the year; this marvelous big variety should give rise to other even clearer and purer rose colors. 'Jane Austin' (Griesbach) was another large rose of almost equally important breeding potential, and both of these "roses" performed well as both seed and pollen parents.

The purest color in deep rose pink was found in 'Cherry Cheeks' (Peck) and the treated 'Vivacious' (Munson), and this wonderful clarity of color and their beautiful round shape make these two important parents. In light pinks 'Zadol' (Spaulding) and 'Pink Superior' (Fay) were the clearest varieties used in treated forms, followed closely by the tetraploids 'Pink China' (Hardy) and 'Shell Pink' (Fay). 'Pink Fluff' (Spaulding) and F63-1 (Fay) were excellent parents in the treated forms used.

The Munson tetraploids grown were a delight in color, which in general was a blending of pink, rose, coral, cream, peach, in varying tones; these beautiful colors, however, resented the Southern California heat. Even so, it was impossible not to like the purity of color in 'Scarborough Fair', 'Empress Mei Ling', 'Domani', and 'Georgica', the latter having wonderfully branched short scapes, also. The very large pink 'Secret Garden', fine as it is, does not have the same purity of color.

Among the lavenders and lavender-purples, 'Tai Pan', 64-37, and 'Charlemangne' (Moldovan); 'Little Wart', 'Wannetta', 'Lavender Flight', and 'Blue Jay' (Spaulding), 'Lavender Parade' (Fay); Dorothy Lambert' (Lambert) were the best clones available this year. The Moldovan and Spalding varieties showed unusual purity of color here. A small treated plant of yellow-throated 'Silver Shadows' (Munson) and treated 'Lady Mary Montague' (Wynne) gave promising crosses for lavenders.

Among the melons the best performers were 'Lady Cynthia', 'Kathleen Elsie Randall' (Fay); and 'Loyal Subject' (Bro. Charles). 'Alison' (Peck) faded too badly in our sun to be ranked with the preceding three. 'Lynn Markham' and 'Harry Randall' (Fay) will be outstanding on larger clumps, probably.

Reports coming from hybridizers include the exciting news from James E. Marsh of Chicago that his new purple and lavender seedlings in 1971 were even better than he had hoped for; his red tetroploids did not show the same progress. Dr. Robert A. Griesbach had a number of outstanding new pink seedlings, and Bro. Charles Reckamp had a number of superb new melons. Dr. Virginia L. Peck flowered many fine new seedlings in spite of drought, as did also Wm. A. Munson, Jr., whose whole seedling field was of very outstanding quality.

The Buck garden produced a new pink tetraploid seedling of most delightful color, and a diploid wine-purple self of such marvelous color quality that it demands polyploidizing at once. Treated forms of 'Francis Fay' (Fay), 'June Rhapsody' (Childs), and 'Grace Lenington' (Lenington) gave most interesting crosses when combined with some of the new tetraploids already mentioned.

This sketchy and very incomplete report for 1971 hopefully does reflect the energy of effort and the resulting progress in the improvement of the daylily, which is still the finest and most unfailing summer perennial for so much of our country.

GROWING AMARYLLIDS IN OVERCROWDED POTS

JOSEPHINE DE N. HENRY, *Gladwyne, Penna.*

Here in the greenhouse the most spectacular displays of Amaryllids come from the overcrowded pots. A few have been neglected, and others have been *deliberately* left undisturbed to such an extent that the pot is completely packed with the bulbs. In some cases the bulbs are totally upon the surface of the soil and quite often too, the pots are cracked by the expanding roots, necessitating a new and larger pot. Years ago I begged my mother not to disturb some of these overburdened containers because a pot of many bulbs abloom is an extraordinarily beautiful sight. To her, and to most bulb specialists, members of the Amaryllidaceae deserved better treatment. The only drawback that I see to too many bulbs per pot is that each plant requires more space upon the bench in the greenhouse. They also require more frequent watering and fertilizing.

One eight inch pot now accommodates some eighteen. This is a vivid red hybrid between *Amaryllis* x *henryae* and van Meeuwen's 'Graceful'. This cross was made by my mother because she was so disappointed in the lack of grace in the latter hybrid. The stalks, of a lovely purplish hue, were heavy in proportion to the blossoms which were small but of fine form. She visualized the result as being an improvement on this Dutch miniature, which it happily proved to be. The resultant plant is beautifully proportioned and vigorous. The foliage is very dark and glossy green, the scapes are tinged with pinkish violet, and the flowers are well proportioned and of splendid substance.

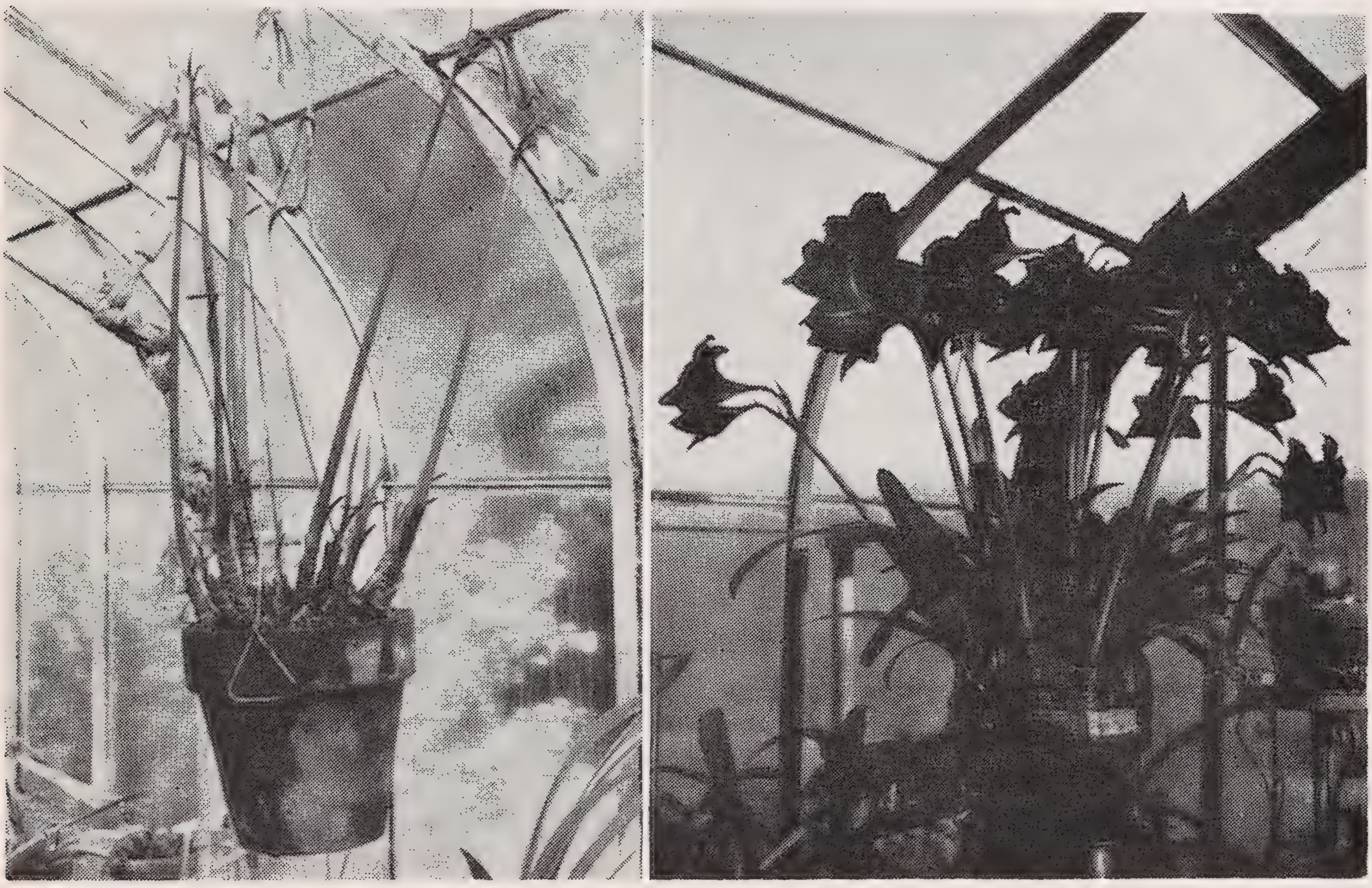

Fig. 27. Left, **Eustephia darwinii** Vargas. Right, Amaryllis x **henryae** Traub x **Amaryllis** clone 'Graceful'. From color prints by Josephine Henry.

They are totally deep garnet red with light yellow pollen. The height of the plant in flower is eighteen inches above the bulb. Each blooming bulb is fully half out of the soil. The accompanying Figure 27, from a photo taken this year illustrates eleven stalks, many of which boasted four flowers each.

Another handsome Amaryllid is *Eustephia darwinii,* a gift from Dr. Cesar Vargas of Cuzco, Peru. Although it became a part of this collection in 1957, it never flowered until 1969 when it produced a lone stalk. In 1970 there were six beautifully coral-tinted stems with their bright salmon blossoms hanging as though the petal tips were weighted with a lovely green border, the stunning yellow pollen dangling below upon red filaments. It was just beautiful, even though there was only the promise of bronzy foliage issuing from the bulbs. The seven-inch pot is tightly packed with the bulbs, and wee young ones are sitting upon the interstices . . . it is just jammed! Perhaps this bulb initially was overindulged when first received.

A *Eucharis* species given to my mother years ago by Mulford Foster, *E. fosteri,* has become a mound of bulbs from which issues a billowing of rich green and glossy foliage. The green display throughout the year justifies harboring the plant alone. The flowers are small and white, but their display deserves scant comment.

The other *Eucharis* (I don't know whether it is the same species as the above, but they do resemble one another in spite of the difference in their habitats) is from the region Northeast of Lake Titicaca in Peru near Sandia. It was growing on a rocky ledge well beyond my reach and was discovered in my effort to obtain a clump of *Amaryllis,* presumably *A. forgetii.* It was nearly impossible to gain a foothold upon the very narrow ledge, and I had to flatten myself against the rock in order to give myself a chance to get the *Amaryllis* bulbs from an even narrower ledge way above my head. A friend handed me a long pole. It was no easy matter to look up and pry the bulbs loose and maintain my balance, but by very cautious prying for some time—they were happily attached—I made some headway. Suddenly, the mass came loose showering me with bulbs, gravel and detritus, the latter two falling down my back. After gingerly letting myself down, I collected the bundle of bulbs and found the *Amaryllis* was intergrown with a *Eucharis* species—a bonus! After presenting the treasures to my mother, I hastily resorted to the roaring river, feeling my way between the shrubs and boulders, to remove the scratchy, wet debris from my back and nearly take a bath. It had enjoyed cramped quarters upon its ledge. Here this species thrives with all the bulbs forced from the soil just about in the same manner as in its own habitat. It is potted primarily in what amounts to one part soil, one part coarse builders' sand, one part peat, plus sprinklings of fine and coarse road grit. A few little pieces of charcoal are tossed into the mix. In my family there have been few hard and fast rules concerning soil mixtures, perhaps due to the fact that so many opportunities for observation of plant localities and their soils have been beneath our feet and sifted through our fingers. After all, in far places one does not always have a proper digging device, and I have collected from Alaska to Florida, most of Mexico and Central America, a good deal of South America, Iran, India from Kashmir to Assam, and in the interior of China. I have often resorted to any implement—files, tire irons, knives, etc.—and, naturally, the hand finishes each excavation. All of this has impelled me to behave like a seasoned and experimental cook—adding a little of this and a little of that, unlike a young Englishman of my acquaintance who protested that he did not see the point of more than three soil mixes. Obviously, he had no familiarity with geology nor experience in the field.

The most admired *Amaryllis* is the *Amaryllis* x *henryae* which Dr.

Hamilton P. Traub used as the frontispiece in his book, ''The Amaryllis Manual'', to illustrate what he proclaims to be the finest small *Amaryllis* extant. *Amaryllis* x *henryae* 'Frontispiece', as I propose to call it, has remained undivided since it emerged as a seed fledgling and was potted. Each year my mother had intended removing a bulb but because of the beauty in bloom, it was delayed during her lifetime. This year I carefully removed three blooming-sized bulbs and one wee one from the perimeter of the pot immediately following the blooming period. It was hard to bring myself to do this, but after this a cluster of fourteen bulbs remained. Their roots were hosed a bit and dead ones removed, but the bulbs were not separated before restoring them to the same sized pot with a fresh, loose mixture of soil of the type employed by my mother.

In innumerable sites bulbs were cramped as some of ours now are in pots. On these ledges they obviously received considerable run-off or drip from the rock faces which, undoubtedly, transported nutrients to the rather naked bulbs whose roots had gathered falling material about them for sustenance.

However, many others of the Amaryllidaceae, such as *Stenomesson, Eucharis* and *Hymenocallis,* including the green species (formerly *Stenomesson viridiflorum*) grew sporadically. It seemed that when their existence was threated or they were required to make an effort for their survival, they proliferated. The finest clump I ever saw of *Eucharis* (formerly *Urceolina*) was on the top edge of a steep, uncomfortable road embankment. A green *Hymenocallis* was massed along an irrigation ditch which was excessively steep so the running water, plus the threat of a cave-in, was ever present. I do not know how much of this might be true, but merely observations in the field have caused me to consider it possible that their increase is above normal when deprived of favorable conditions. No doubt, growing bulbs in this fashion would not be good in every case, but here in our latitude under greenhouse conditions of 60 degrees during the day and cooler at night, scant or no watering from mid-summer, they thrive. This illustrates that it is not necessary to repot as often as frequently recommended. Actually, I am sure that not one of these pots has received fertilizer on any regular basis. One advantage we do have is our own water supply.

GOOD REPRODUCTION OF COLOR SLIDES

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Having noted that most printed reproductions of color slides were not only too contrasty but of very poor quality, I consulted Robert Armstrong of Alvin's in Pasadena. He told me that Eastman Kodak could make an internegative which when printed on Panalure paper, gave very good black and white prints. I used this method and the results are very good as shown in PLANT LIFE 1970 pages 50 through 55.

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A BULB COLLECTING TREK THROUGH MEXICO

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From July 2 to July 20, 1971, Dr. Thad Howard and I enjoyed the adventures and thrills provided by Mexico's scenery, climate, culture and plant life. Traversing twelve states, we made one hundred and twenty collections ranging from *Anthericum* to *Zephyranthes.* In addition to the majority of recollected species, as usual, we found a few plants new to us both and to science.

DURANGO

As is the custom, the hot and relatively uninteresting Sonora desert we crossed in the cool of night, arriving for a cat nap about five P.M. an hour or so outside the city of Durango. With the Saturday morning sunrise, we awakened, and the field trip officially began. Exploring our immediate environment, we found a white flowered *Anthericum,* a few *Milla biflora, Zephyranthes longifolia,* an *Oxalis sp.,* and an interesting bulbous succulent with a little three inch rosette of leaves and a branching stem with small white flowers. Fifteen miles further, we stopped again to find more *Millas* in addition to a stoloniferous *Allium* species.

One of the more spectacular sites of the trip greeted our eyes just east of the city. A still undescribed *Hymenocallis* from that locality was in peak flower and formed a white sheet on both sides of the highway, fading out only at the base of the hills beyond. While digging a few, we found it impossible to walk among them without stepping on seedlings, so thickly did they grow. The aquatic *Allium Mannii* Traub grew on the other side of Durango in low spots.

West of the city, as the altitude increased, so did our comfort. On our climb into the mountains we found a *Calochortus sp.,* a *Nemastylis sp.* in leaf, *Allium Durangoense* Traub, and several types of terrestrial orchids. We began a close watch for the bright yellow *Tigridia Dugesii* which we found with already faded flowers after several stops. In this same vicinity, normally rock-loving Sprekelias were seen growing and blooming on the flat roadside.

East of the village of El Salto, the cool wet Llanos were home for another *Tigridia,* the (blue through purple) *T. durangense,* diminuative in size, and variable in form and markings, it grew in the clay muck with a semi-aquatic *Allium sp.* Disbelieving native children gathered around as the gringos gathered and washed the plants in the chill ponds.

Heavy rains and fog brought visibility to a minimum and slowed the afternoon mountain driving. As evening began to darken the landscape, we re-collected another unpublished *Hymenocallis* in flower and fruit east of Mazatlan at Km. 224. This shade-lover with broad, thin leaves grew in fluffy black humus and could almost be pulled rather than dug from the ground.

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MAZATLAN TO TEPIC AND BEYOND

Our arrival in Mazatlan brought us into humid coastal lowlands. In this environment we found *Hymenocallis sinaloensis* the next morning flowering in roadside ditches on our way south down the coast. Soon, thick colonies of another little Irid, *Cypella Roseii,* appeared. We saw them by the thousands growing in hard-packed sand. Though predominently pale blue with maroon spotting in the centers, some of the globular-shaped flowers ranged from white all the way to dark purple with all combinations in between. As while digging the *Hymenocallis,* mosquitoes attacked us in swarms until our continued repellent applications made us unbearable to the apparently insatiable insects.

After passing through the village of Acaponeta, we found our first *Besseras* growing among the roadside rocks. Ten Km. further a large colony of *H. sinaloensis* beckoned us to stop and appreciate more closely their beauty with eye and camera.

Forty-one km. from Tepic, we spotted another spiderlily. We were then into *Hymenocallis horsemanii* territory, and we found a small form of that plant growing by the roadway. The *Besseras* were still with us, and we made our collection from a group not far away.

We turned right toward San Blas and the blue Pacific in mid afternoon. After passing through palm and jungle country we arrived at the village where we waded, rested, and ate lunch before returning to the main highway.

We found a coral-flowered *Stenorrynchus sp.* of terrestrial orchid in bloom from the San Blas turnoff all the way to Tepic and beyond. The rock bluffs seventeen miles north of the city were the home of a green flowered tuberous *Begonia sp.* with interesting jagged leaves in addition to a *Pitcairnia sp.* of rock-loving bromeliad and a ginger-like plant. Our last plants for the day were *Tigridia passiflora* in fruit and bud and a dwarf *Euphorbia sp.* with the bright red bracts of its poinsettia relative, both collected just a couple of miles north of Tepic where we spent the night.

Again headed south, we collected more *Tigridia passiflora,* this colony containing members with less colorful and clear markings and often with yellowish segments as compared to usual white. *Bessera, Hypoxis,* and *Manfreda* also grew on the knoll.

From a rock formation at km. 176, a beautiful patch of color caught our eye as we whizzed past. When we turned back, we found the source of the brightness to be a Bletia-type orchid in bloom. At the end of a two foot spike, a group of jewel-like purple and creme flowers opened wide. Growing also in the cool damp moss were another tuberous *Begonia sp.* in leaf and a small fleshy-rooted *Sisyrinchium* with showy little yellow flowers.

IXTLAN DEL RIO TO TEQUILA

We soon passed through a lava flow where we photographed the barren but exotic landscape of igneous boulders. Ixtlan del Rio lay not far down the highway, and two miles on the other side of the city, we located a population of extremely robust plants of *Hymenocallis horsemanii* with bulbs and stems twice the size of the first we had seen. Various members of the Commellinaceae also grew here with some white flowered Anthericums.

One kilometer past the Nayarit-Jalisco state line, on a steep damp hillside, a deep-growing but beautiful rose pink *Oxalis sp.* was recollected along with a Bomarea-type vining plant having tuberous roots. Another large colony of scarlet *Bessera elegrans* nine miles further provided the second location in Jalisco for digging.

Back into relatively flat land, we noted the appearance of the first *Milla biflora* of any quantity. The soil here was dry, pebbly, and of a light reddish-brown color. Although this group did not approach the same quality we expected to find later, we nevertheless took a representative bagful with the trusty rockpicks.

Four km. down the highway at km. 94, we ran into a virtual ''rock garden'' on an otherwise barren rocky hillside. *Milla biflora,* a *Nemastylis sp.* in leaf, *Tigridia passiflora,* yellow flowered Anthericums, the coral-flowered *Stenorrynchus sp.,* a small *Oxalis sp.,* and a *Polianthes sp.* provided an unusually rich plant collecting site.

The village of Tequila provided an excuse to stop for eating. Distilleries here for years have processed the potent juice of *Agave tequilana* into the famous beverage for which the town was named. Whole mountainsides of the plant covered the land for miles on both sides of the town.

GUADALAJARA TO THE PACIFIC COAST

We turned southwest toward the coast upon reaching the outskirts of Guadalajara. Three km. down highway 80 we collected *Milla biflora* in seed plus another *Nemastylis sp.*

At km. 50 we found *Hymenocallis acutifolia* growing under several inches of water in a roadside ditch. Attempts to make a collection proved futile as the bulbs clung stubbornly to their deep hold in the mucky clay.

Ten km. further, when we stopped to investigate the first *Hymenocallis mexicana,* what should we find but a Sprekelia—no, several of them—growing in the dark roadside soil. No, it was not a Sprekelia—or was it? The ovaries were sessile, but the leaves, as many as ten, were flat, very wide, and shiny green. We both began digging, and soon Dr. Howard found a bulb in flower. It was rose pink of typical *Zephranthes* form. We quickly nicknamed the plant *Zeph. ''sprekeliafolia.''*

We reposed at a newly refurnished hotel, identifiable only by its new neon sign on a narrow bumpy street in the little town of Union de Tula. That night we enjoyed the experience of staying at one of these really rare places with large comfortable rooms, sturdy beds, a combination bath-shower, and hot water . . . all for $1.00 each.

Among the rocks of a hillside outside Union de Tula at km. 129 a colony of *Bravoa gemniflora* with its stalks of bright red pendulous tubular flowers caught Dr. Howard's eye. We stopped to collect these and a *Calochortus sp.* in leaf.

Before arriving at a very rich ravine at km. 169, we found more of the *Oxalis* of the day before plus a few orange-red Besseras south of Autlan. The ravine yielded the beautiful Bletia-type orchid in a slightly more purple form, another tuberous *Begonia sp.,* a colony of a purple flowered *Pinguicula sp.,* a *Bravoa sp.* in bud, *Achimenes,* aroids, and *Hymenocallis azteciana* Traub in leaf. They all grew in beautiful peaty humus in shady spots on both sides of the steep gorge down which trickled the icy water of a mountain spring.

We soon spotted the above *Hymenocallis* in flower, *Tigridia meleagris* in leaf, and the first of the dwarf Sprekelias in leaf and fruit. We discovered that some of these miniatures had bloomed from bulbs only one inch in diameter.

BARRO DE NAVIDAD TO URUPAN AND BEYOND

We took advantage of the blue-green Pacific for swimming, and we ate lunch on the beach of Barro de Navidad before proceeding southeast on Mexico 200, then northeast on Mexico 110 toward Colima. From km. 23 through 20, we collected more dwarf Sprekelias, a tuberous *Begonia* with maple-shaped, red-speckled leaves, a dark pink flowered *Pinguicula sp.* growing in little dirt pockets of a flat limestone rock face, and giant purple Besseras. Almost into Colima, we turned back to try again locating an illusive yellow flowered *Nemastylis sp.* which had thus far evaded our close watch. A search on foot rewarded us with the Irid, so we continued on to Tuxpan.

Wednesday morning a stop in the pine forests west of the Jalisco-Michoacan state line netted more *T. meleagris* and *Sisyrinchiums.*

We noted *Hymenocallis mexicana,* a few *Zephranthes,* and *H. riparia* along the highway before we arrived at Zamora. East of here, at the exit from the village of Zopoca, we found a white flowered stoloniferous *Allium sp.* which was easily dug from the dark brown soil.

We turned south from Carapan on highway 37 toward Arteaga, but we saw no different plants until we stopped thirty miles south of Uruapan, a few kilometers past the village of La Laguna. A pasture, now very dry and overgrazed, which had supported "tricolor" Besseras in previous years, beckoned for our investigation. I could find no hint of a plant, but Dr. Howard soon noted an inch of *Bessera* leaf poking from the soil. So we collected as best as we could by the scanty foliage, noting that holes in the ground and empty corm coats sometimes marked the spot where a meal had been unearthed and consumed by a small quadruped.

We encountered another real adventure at km. 165 where we stopped to recollect the rare blue-flowered *Dandya Hannibalii.* The sun sank lower in the late afternoon sky as we two plant people began our ascent up the steep, rocky, tree-studded hillside. We searched in vain about one-half mile of ground when we decided to climb to the top and then back down to scan the lower ledges. Panting, we reached the top with no success. As we dismally climbed downward, I noticed one tuft of terete leaves and asked, ''What's this?'' ''That's it!'' exclaimed Dr. Howard. With the optimism generated by this find, it was not long until we found more and more until Dr. Howard came upon a big colony. In the quickly fading light we dug a substantial number of corms even finding two in bud. The moon coming over the mountains hailed us and was our guide on the lonely stretch to Arteaga where we stayed that night.

PLAYA AZUL TO IXTAPAN

Thursday morning we decided to venture down to Playa Azul, the coastal town thirty miles south of Arteaga. On the stretch were *Hymenocallis glauca, Bessera elegans, Manfredas sp.,* and various terrestrial orchids. The little town provided a beach for swimming, crab watching, and rock collecting. We soon turned north again and ate lunch back in Arteaga.

In a burned-off clearing, then a cornfield, at km. 245 we found both *H. glauca* and *H. mexicana* growing side by side. While the latter flowered, the former set seed. No hybridization was apparent.

In the next few miles, we collected most of the air plants of the trip. These included *Oncidium cebolletta,* an *Epidendrum sp., Tillandsia caput-medusa,* and *T. carinata.*

At San Gabriel Zamora, Dr. Howard noticed a pink *Crinum* blooming in the front yard of a native abode. He asked if I had noticed. Since I had been looking elsewhere, we turned around to look again. This out-of-the-ordinary *Crinum* at first glance resembled *C. americanum,* but with its larger, more abundant pink flowers, reminded Dr. Howard of *C. erubescens.* We stopped and chatted with the lady of the household, and Dr. Howard successfully completed a business transaction. Her son unearthed several large bulbs which had escaped via rhizomes under the fence. Thus not all our plants came from the wildlands.

Before arriving at Patzquaro, our day's destination, we made a stop for a large colony of *Zephranthes* of the Jalisco complex. We found it possible to collect a good representation of all the shades—from white through dark rose pink.

We departed the city early, drove through Quiroga, and stopped in Morelia to visit the magnificent cathedral and purchase some food. Still on Mexico 15 we saw more dwarf Sprekelias and *Hymenocallis* before stopping at km. 212 for the gathering of another tuberous *Begonia,* this one with leaves having red margins and silver undersides. Another Stenorrynchus-type orchid was found here in the damp humus.

In the next few kilometers as we climbed in altitude an *Echeveria sp.,* some specimens over a foot in diameter, and a *Calochortus sp.* appeared on rock faces beside the road. Likewise, two *Sisyrinchium ssp.,* one a couple of feet tall, caught our eye before we reached the pines and evergreens.

A small rise along the road at km. 153 again proved to be a valuable spot this year as *Tigridia violacea,* deep in moist heavy clay, a Bletia-type terrestrial orchid with green and purple flowers, *Bravoa gemiflora* in its orangey-red form, and robust *Milla biflora* grew in abundance.

Another such knoll, replete with plant life, attracted us at km. 117. Many vining *Bomareas,* more *Tigridia meleagris,* another *Calochortus sp., Oxalis,* a *Milla sp.,* and *Allium michoacanum* covered the low rise. The *Bomarea* tubers luckily did not fall apart as they usually do upon being unearthed. One kilometer more and the ''non-flowering'' Milla sp. we had also seen in Jalisco again grew thickly-like clumps of grass. We dug more here and packed these in peat with the tuberous roots from the previous stop.

A new *Echeveria sp.,* this one with large wavy leaves, along with the pretty *Oxalis deppei,* grew in the fluffy black soil of a rock hillside at km. 44 after we had crossed the Michoacan-Mexico state line and had passed through Toluca. Before we reached Ixtapan, our spot of repose for the day, our last stop resulted from my desire to pluck a scarlet blooming *Pitcairnia* from some roadside rocks.

STATE OF GUERRERO TO ACAPULCO

The next morning we made our first stop five km. outside the city for *Milla ''filifolia''* growing in dryish pebbly soil. At the lookout point, km. 204, in the state of Guerrero we not only spotted marvelous scenery but also a miniature *Anthericum* in leaf, a white flowered *Nemastylis* in leaf, plus more *Milla ''filifolia.''* Within the next mile, *Zephyranthes Nelsonii* appeared.

As we journeyed further southward, we saw *H. glauca* again beginning at km. 110 and *Milla magnifica* at 120. An impressive sight at km. 65 was a colony of tuberous Begonias, all of which sported only one leaf. Still more amazing was the fact that the flower stem emerged directly from the leaf's center. Needless to say, we rock-picked several of these exotics from their tenacious hold on the vertical rocks.

Growing in profusion at km. 73 was *Milla magnifica* in leaf. In this Bessera-like rocky terrain, they grew in humus pockets between and around the strata. These corms can exceed two inches in diameter in cultivation, and some of these collected corms almost matched this size. In ten kilometers, we arrived in the scenic tourist town of Taxco where we ate lunch and shopped.

We noticed scarlet *Bessera elegans* and *Hymenocallis riparia* before reaching Iguala where, in search of pendulus flowered *Tigridia Ehrenbergii,* we turned west toward Teloloapan. Ten miles from the cutoff, a sloping rocky cornfield appeared promising. An Irid did grow here. But much to our surprise a dissected spathe showed the plant to be a white *Sessilanthera sp.* We had planned to find this one later south of Iguala and so took the opportunity of doing the re-collecting here instead.

South of Iguala, approximately thirty miles, started the territory of the interesting white flowered *Dandya thadhowardii.* When we finally found a colony, they really grew in abundance. In light red gravelly soil in forest shade, there appeared to be thousands of the corms each within inches of each other.

After passing through Chilpancingo, we noted the appearance or reappearance of four of our friends, namely a yellow *Sessilanthera sp., Hymenocallis glauca, H. riparia, Bessera elegans,* Sprekelias, and more terrestrial orchids in leaf.

Dr. Moore described the type location of *Petronymphe decora* as being Acaquizotla, and that is where we headed after turning off highway 95 at km. 34.5. Through two gates and in and out of dangerous chugholes we came into the lush little area through which the old highway once wound. Various achimenes and the yellow *Sessilanthera,* a Bletia-type and a semi-terrestrial orchid we found on the rocks. Bromeliads and an Oncidium-type orchid hung precariously over a pit cave. Also, we noted the presence of many ferns and tuberous *Begonias.* Dr. Howard came through with another new plant here too—this one being a small, glabrous, wide-leafed *Hymenocallis sp.* in fruit which he spotted among the other greenery. As for *P. decora,* we did see a few on the rocks, but as dusk approached, we chose to continue to Acapulco and make the time consuming climb to the plants on our way back.

The bustling city, the white beaches, and glistening blue waters of the bay coaxed us to relax and enjoy our Saturday in typical tourist fashion. The next day we drove west on coastal highway 200 to Zihuatinejo, an undiscovered and undeveloped ''miniature Acapulco'' also built on a bay. Not only for sight-seeing did we make the up-coast excursion also for investigating Petatlan, type locality for *Hymenocallis cordifolia.* Villagers in that town the next morning admitted to knowing of the mountain-growing ''weed,'' the leaves of which they fed to their pigs. On several sets of conficting directions we spent hours trying to reach the mountain road where the plant reputedly grew. Bad luck forced us to return to Acapulco without this illusive Amerindian Lily.

MINOR AUTO ACCIDENT AND RETURN

Our ensuing minor auto accident on the outskirts of the city gave further evidence of the bad luck of this day. The front end of Dr. Howard's VW bus suffered the damage as we hit the rear of a flatbed truck which stopped suddenly for some obstacle while going around a curve. Thus the second phase of our trip, sans private transportation, mainly involved sight seeing in Acapulco for two days and in Mexico City for six days when the insurance company shipped the bus north for availability of parts. The delay included the time-consuming procedure of having official paperwork completed, first by the insurance company and then by a federal office, to allow us to leave via public bus rather than by car.

Dr. Howard, being a true plant collector, would not let the absence of an auto disuade him from gathering more species. Of our days of detention, one was spent at the University of Mexico campus via city bus where we recollected a rare white *Habranthus sp.* whose bulbs at maturity reach *Amaryllis* size. Several terrestrial orchids too were found in this Pedregal area where the decomposed black lava made for a wonderful soil. Complete with pick, sharpshooter, and bags of plants, we no doubt presented an unusual picture on the bus travelling back across town.

The next day we caught a bus to Pachuca sixty miles north and then chartered a taxi. We unsuccessfully searched the alpine countryside for *Tigridia alpestris,* but we did collect another *Calochortus* and a very dwarf white to purple *Nemastylis sp.* which may be a new one.

The bus ride to Monterrey to Laredo to San Antonio brought us home on the evening of the eighteenth day, and only after another month would Dr. Howard be able to return for his repaired bus and the plants.

In two weeks we had completed a whole summer's worth of field work. The pace was hectic, and the work was often hard. But the scenery, the cities, and the experience of botanizing in Mexico will not soon be forgotten.

LATIN AMERICAN AMARYLLIDS, 1971

Pedro F. Ravenna, *P. F. R. Castilla, 21128*
Sucursal 21, Santiago, Chile

[The text translation which follows was published by the writer in ''Noticiario Mensual, Museo Nacional de Historia Natural'', Nr.173 (23 Dec. 1970), Santiago, Chile. Seven new species of *Habranthus* were described in that work; additional illustrations, as well as the original, are included here.—*Pedro Félix Ravenna*]

Habranthus salinarum Ravenna, Notic. Mens. Mus. Nac. Hist. Nat. Chile, 173 :3.1970.—*Plant* to 15-20 cm tall. *Bulb* subglobose about 20-28 mm long, 18-26 mm in diam., dark brown on the outside, produced into a pseudo-neck for 25-50 mm. *Leaves* often serotinous, very narrowly linear to 15-20 cm long, 1-2 mm broad. *Scape* cylindrical to 10-16 cm long, 2.5 mm broad. *Umbel* one-flowered. *Spathe* membranous, to 23 mm long, bifid for 7 mm. *Pedicel* about 15-22 mm long. Flower white, narrowly infundibulate, ca. 35 mm long, 18-22 mm in diam. *Ovary* narrowly eliptical to 4.5 mm long, 2.5 mm broad. Perígone: *tepalsegs* oblanceolate, connate for 2.5 mm, the outer ca. 36-37 mm long, 8-8.5 mm broad, apiculate, inner subequal, acute or almost obtuse. *Stamens:* filaments declined, somewhat incurved at the apex, lateral episepal ca. 8.5-11 mm long, upper episepal to 14-15 mm long, lower epipetal ca. 16 mm long, lateral epipetal about 19-20 mm long. *Style* declined ca. 27.5-31 mm long. Stigma trifid, its divisions recurved, to 1.5-1.7 mm long. *Capsule* globose-tricoccous, ca. 10-11 mm in diam. *Seeds* compressed, black, semilunate-reniform or ovate-cuneate, ca. 5.5-7.5 mm long, 4-5.5 mm broad. (Fig.28)

Hab.—In sandy salty places at the Salinas Grandes border, in the province of Córdoba, Argentina.

Habranthus salinarum is somewhat similar with *H. cearensis* Herb.

In fact, the flower of the latter species shows considerable resemblance in shape, but it is smaller in size; on the other hand, leaves are broader. *H. andalgalensis* Rav., a species from Catamarca, has whitish flowers, but larger, and its leaves are practically filiform.

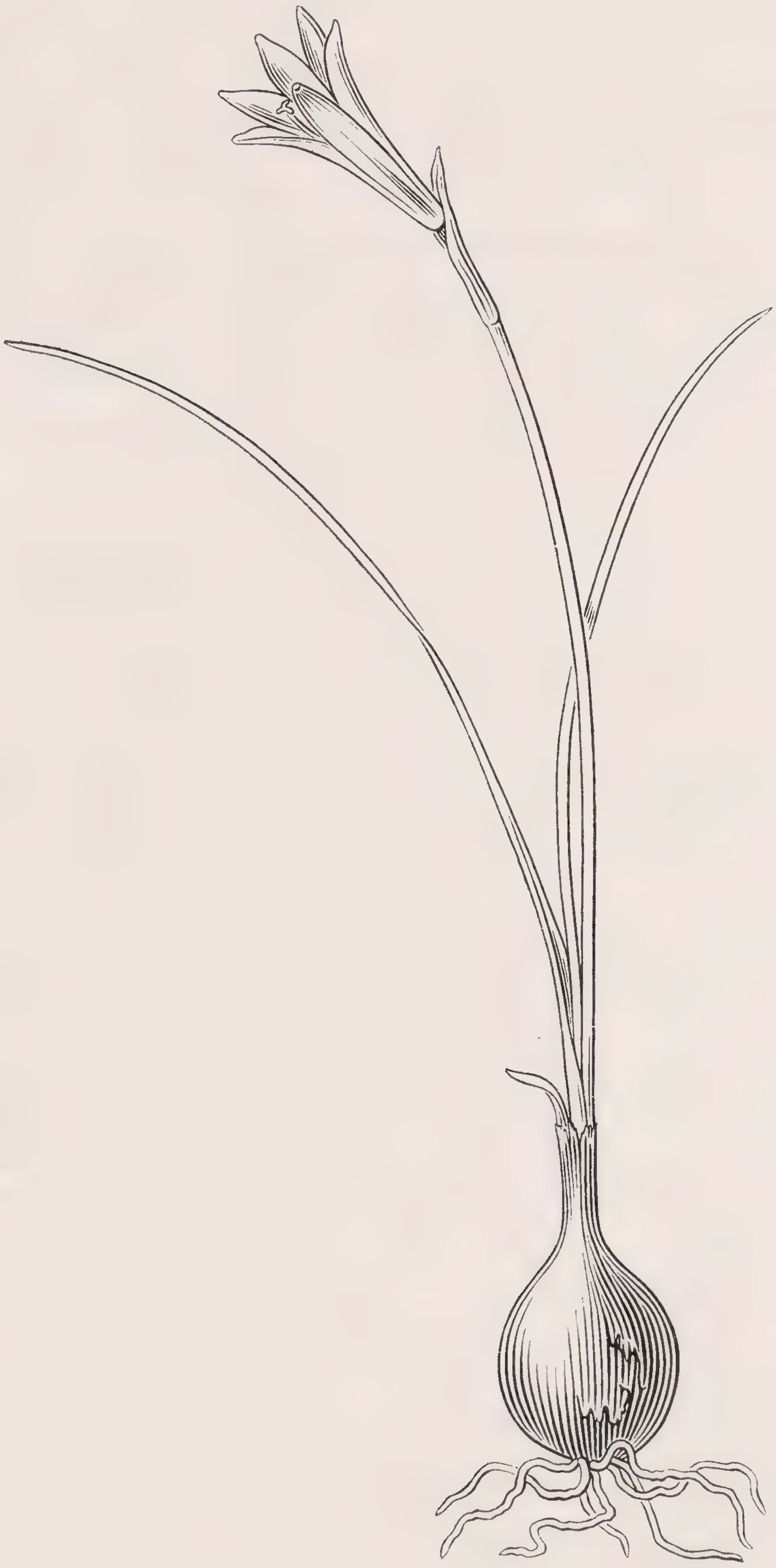

Fig. 28. **Habranthus salinarum** Rav., general view of plant (x 0.3). From figure in B. Piccinini in Ragonese's "La Vegetacion de Las Salinas Grandes." P. F. Ravenna del.

The species was treated by Ragonese in "La vegetación de las Salinas Grandes", under the name of "Zephyranthes mesochloa" (see Rev. Inv. Agr. 5(1-2): 108, f. 8. 1951).

Habranthus martinezii Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 3. 1970.—Plant to 15 cm tall. *Bulb* subglobose, about 16-20 mm in diam., produced into a short pseudo-neck; the outer coats of dark brown. *Leaves* none at anthesis, serotinous, about three, linear channelled, a bright green, ca 3 mm broad, nearly of the scapes length. *Scape* cylindrical to 8-14 cm long, 2.3 mm broad. *Umbel* one-flowered, *Spathe* ca. 21-34 mm long, of a pale whitish-pink or reddish-ocher, fenestrated or bifid for 8-18 mm. Pedicel to 25-40 mm long. *Flower* ca. 40-44 mm long, 24-45 mm in its horizontal diameter, and 30-50 mm in its vertical diam. *Ovary* oblong or almost obvate, obtusely trigonous, a dark green, to 28-52 mm long, 2.1-3 mm broad. Perigone tepalsegs oblanceolate, a pale pink, purple-brownish in the lower third, connate for 2 mm at the base, the outer to 37-51 mm long, 10-13.5 mm broad, with an obtuse, 0.9-1.5 mm long, apiculum, the inner to 35-46 mm long, 7-10 mm broad. *Stamens:* filiments carmineous below, whitish toward the incurved apex, upper episepal to 9-11 mm long, lateral episepal ca. 12-19 mm long, lower epipetal to 16-19 mm long, lateral epipetal about 18-21 mm long. Anthers more or less semilunate, ca. 3-3.2 mm long. *Style* declined, carmineous excepting the upper third which is white, about 29-31 mm long; stigma trifid, its divisions recurved, to 2.5-2.7 mm long. *Capsule* squared-globose, almost tricoccous, ca. 12 mm in diam. *Seeds* semicircular, compressed, black, ca. 4mm broad with membranous papyraceous margins. See Fig. 29.

Hab.—Fields of the province of Entre Ríos, in the Martín Garc´a island, and on the hills near Pocitos, in the province of Salta, Argentina; also in the Uruguay republic.

Habranthus martinezii resembles somewhat *H. magnoii* Rav., a native of the province of Córdoba (Argentina). The latter has, however, broader, pruinose, leaves, and its flowers are greenish toward the base.

It was brought to me, for the first time, by my friend, the enthomologist Antonio Martínez, in whose honor the species is dedicated. He collected bulbs on the hills near Pocitos, in the province of Salta. The flowers that I had firstly examined were from plants of that population cultivated by me in Buenos Aires. Afterwards, I have seen plants, at the Darwinion Institute, from the province of Entre Ríos, and, in 1967, I found the same species growing in wild state in the Martín García island. As appears from the mentioned records, the species seems to have a discontinuous range, rather unfrequent in the genus.

Habranthus chacoensis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 4. 1970. See Figs. 29 and 30. Plant to 18-19 cm tall. *Leaves* incipient at anthesis, linear, fleshy, rather channelled toward the base, upwards almost flat, green, not pruinose nor glaucescent, after the anthesis ca. 11-12 cm long, 5-5.5 mm broad. *Scape* to 11.5 cm long, a pale green excepting a pale pink-ocher near the base. *Umbel* 1-flowered. *Spathe* to 35-37 mm long, of a dirty greenish-pink, tubular for 16-20 mm, bifid or fenestrate at the apex. *Pedicel* to 17-36 mm long, often almost completely included in the spathe. *Flower* ca. 40-45 mm long, 33 mm in diam. *Ovary* almost cylindrical, reddish-brown, to 4.7 mm long, 2.3-

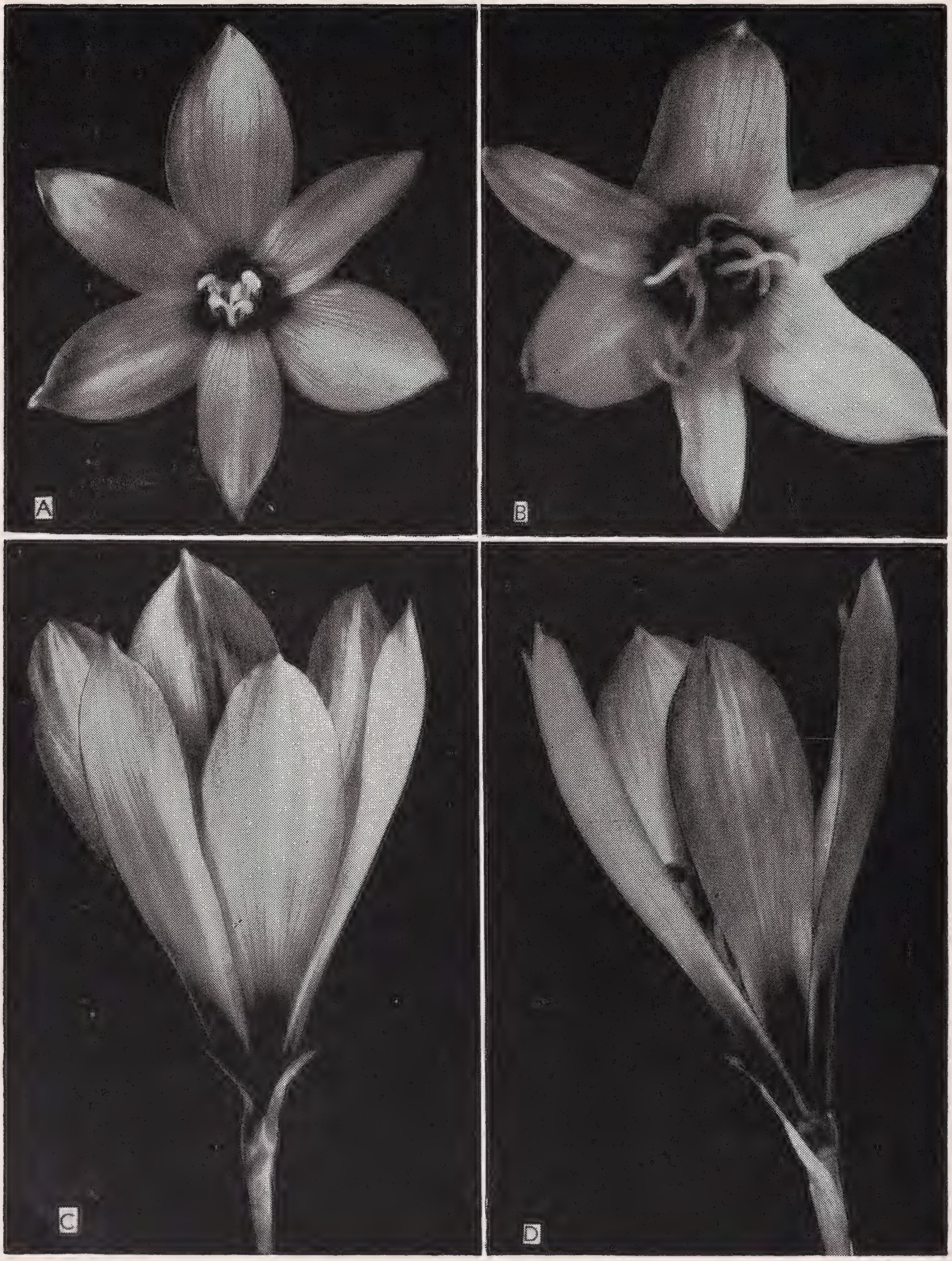

Fig. 29. Front floral views: **A, Habranthus martinezii** Rav., **B, H. chacoensis** Rav. **C** and **D,** side views of **Habranthus erectus** Rav. Photos by S. Magno.

2.4 mm broad. *Perigone* tepalsegs oblanceolate connate for 3 mm, the outer ca. 42 mm long, 11.9-19.5 mm broad, a pale purple or greenish below, externally purplish, whitish inside; the apiculus 1.2 mm long, externally of a carmine-pink; inner acute, not apiculate, of the same color as the outer, lateral pair to 41.3 mm long, 7.5-8.5 mm broad, lower one ca. 42.9 mm long, 6.9-7.5 mm broad. *Stamens:* Filaments of a pale carmine-pink in the lower half, the rest whitish, upper episepal ca. 10mm long, lateral episepal to 12 mm long, lower epipetal 19 mm long, lateral epipetal about 21 mm long. Anthers flexuose semilunate, to 6 mm long, 0.6-0.7 mm broad; pollen of a pale yellow. *Style* about 29.5 mm long, a pale pink in the lower half, whitish upwards, its divisions ca. 7 mm long, recurved at the apex. (Figs. 29 and 30)

Hab.—In sandy clay, in the rainy season, very damp. in the region of Colonia Benítez, province of Chaco, Argentina.

Habranthus chacoensis is related with *H. magnoii* Rav., and with *H. martinezii Rav.* It is separable from both, on account of the lower inner tepal, which is narrower than the others of the same series; this character allies it with *H. erectus.* It differs from the latter because of the leaf shape and the cernuous flower. The lower part of the flower can be of a pale carmine color or greenish.

According to Dr. Schulz, of the Agricultural Experimental Farm of Colonia Benítez (Chaco), this species is the commonest in the region. It adapts itself well to cultivation in Buenos Aires.

Habranthus erectus Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 4. 1970. See Fig. 29. *Bulb* ovate ca. 3 cm long, 2.4 cm in diam., covered with dark brown coats and produced for 5 cm into a pseudoneck. *Leaves* somewhat fleshy, almost filiform, to 20-36 cm long, 0.9-1.3 mm broad, not marginate, very narrowly channelled or furrowed, a pale green or ash green. *Scape* to 10-12 cm long, of a pale green, pruinose, brownish toward the base, ca 2.6 mm broad. *Umbel* one-flowered. *Spathe* membranous, a yellowish-brown, tubulose for 7.5 mm, then bifid for 11 mm. *Flower* erect, of a pale pink, a dark carmine toward the base, almost bell-shaped, to 4.8-5.7 cm long, 35 mm in diam. *Ovary* obtusely trigonous, to 3.8-4 mm long, 3.7-4 mm broad. Perigone: tepalsegs oblanceolate, connate for 4 mm, the outer to 48-53 mm long, the upper outer ca. 18 mm broad, lateral to 14 mm broad, inner series about 45-53 mm long, lateral inner ca 13 mm lata, lower inner about 12 mm broad. *Stamens:* filaments declined, whitish excepting the lower part, which is reddish, the upper episepal to 18 mm long, lateral episepal ca. 15 mm long, lower epipetal about 22 mm long, lateral epipetal to 24 mm long. Anthers semilunate, yellow, ca. 4 mm long, attached in the lower third, from the back, to the filaments. *Style* declined-ascendent, to 29 mm long. Stigma trifid, its divisions recurved, ca. 4 mm long. (Fig 29)

Hab.—In sandy places near San Juancito, in the province of Jujuy, Argentina. It grows near a species of the same genus, with smaller, whitish, cernuous flowers.

This species has tepalsegs of four different sizes, which is an interesting feature. The inner series differs from the outer because of the length, and in both groups bear one tepalseg (the upper or the inner), of a different width. *Habranthus erectus* cannot be compared

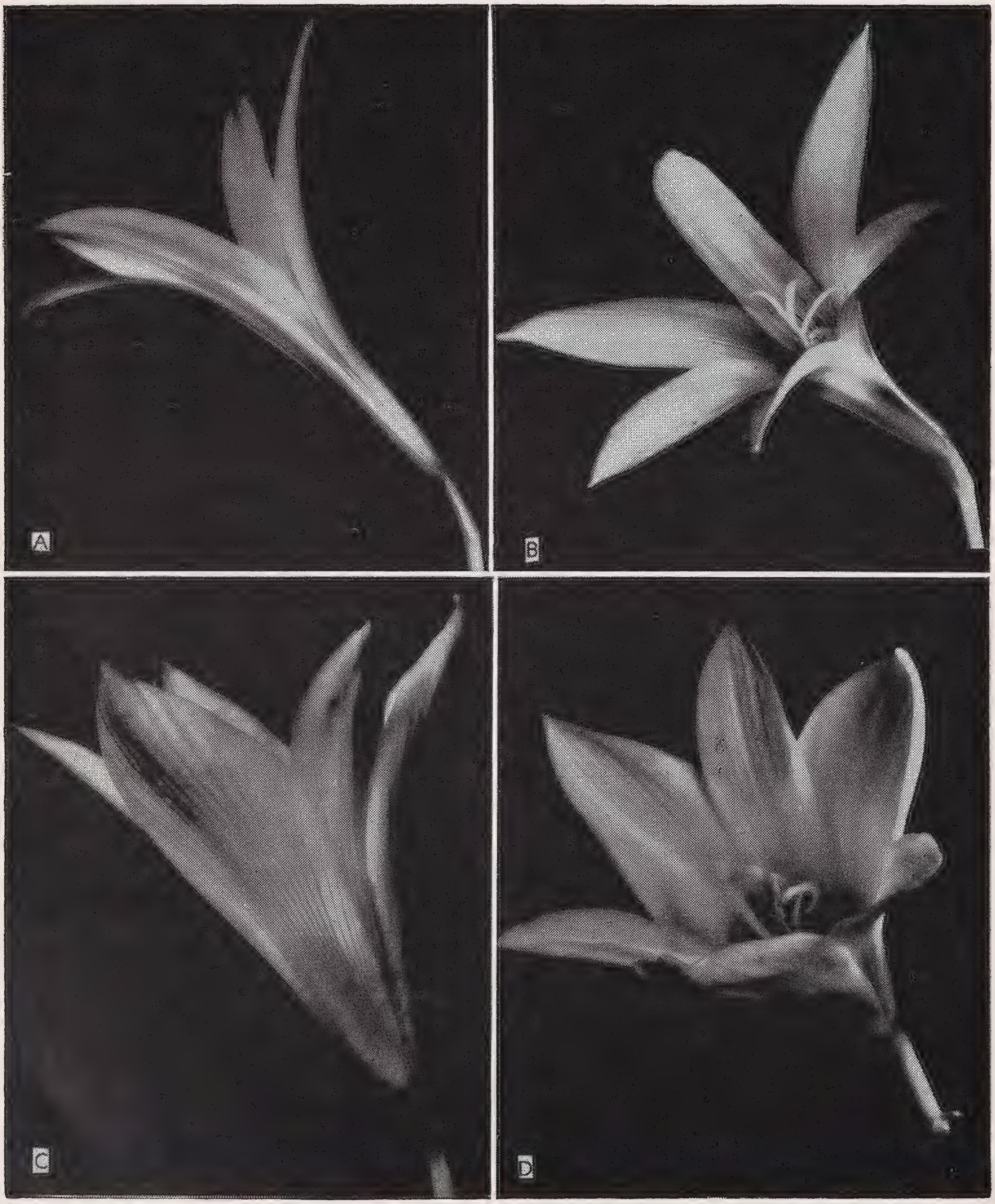

Fig. 30. Side floral views: **A** and **B, Habranthus carmineus** Rav.; **C** and **D, H. chacoensis** Rav. Photos by S. Magno.

with any known species, because its erect flowers and the indicated character of the tepalsegs, which are unique in the genus.

In the same places where *H. erectus* grows, is also found another undescribed species. The latter has leaves of the same shape, but flowers are cernuous, of smaller size and different color.

Habranthus carmineus Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 5. 1970.—See Fig. 30. Plant to 25 cm tall. *Bulb* subglobose ca. 25-30 mm in diam., produced for 4-5 cm into a pseudo-neck, outer coats of a dark brown. *Leaves* at anthesis none, after anthesis to 15-18 cm long, 7-9 mm broad, rather channelled, a dark green. *Scape* ca. 15-20 cm long, sometimes somewhat compressed, a pale green, slightly pruinose. *Umbel* 1-flowered. *Spathe* reddish, ca. 35 mm long, membranous, compressed in the upper part, tubulose for 28 mm, then bifid for 7 mm. *Pedicel to* 6 mm long. *Flower* a carmine-pink, about 45-57 mm long, ca. 45-57 mm in diam. *Ovary* cylindrical sometimes obtusely trigonous, a dark green, to 8 mm long, 2.9 mm broad. *Perigone:* tepalsegs oblanceolate, connate for 1.6 mm, imbricate for 38 mm, the outer to 50-59 mm long, 12-13 mm broad, minutely apiculate (apiculum ca. 0.7-0.8 mm long), inner ca. 49-56 mm long, 9.4-10.2 mm broad, acute. *Stamens:* filaments declined, upper episepal to 10 mm long, lateral episepal ca. 16 mm long, lateral epipetal about 24 mm long, lower epipetal to 27 mm long. *Style* whitish, about 33 mm long; lobes of the stigma erecto-patent or spreading, recurved at the apex, about 7 mm long. (Fig. 30)

Hab.—In grassy fields at Concepción del Uruguay, in the province of Entre Ríos, Argentina. It grows in black soil, near *Habranthus tubispathus* (L'Her.) Traub ssp. *macranthus* Rav., *H. coeruleus* (Gris.) Traub, *Nothoscordum bonariense* (Pers.) Beauv., *N. inodorum* (Ait.) Nich, ssp., *Anemone decapetala,* and others.

A species allied with *H. longpipes* (Bak.) Traub, from which it differs by the tepals closely contiguous almost two thirds of their length; this makes the flower much narrowed toward the base. *H. concordiae* Rav., also from Entre Ríos, has inflorescences 1-3 flowered.

Habranthus carmineus was found only in the region of Concepción del Uruguay. Cultivated in my collection at Buenos Aires.

Habranthus saltensis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 6. 1970.—Plant to 11-15 cm tall. *Bulb* ovate, ca. 4 cm long, 2-2.3 cm in diam., covered with dark brown coats and produced into a short pseudo-neck. *Leaves* none at anthesis, after anthesis, linear, moderately channelled, ash-green, rather pruinose, spreading or often prostrated, obtuse, to 10 cm long (or more?), ca. 6-7 mm broad. *Scape* cylindrical, an ocher-green, to 6.5-10 cm long, 2.7 mm broad. *Umbel* one-flowered. *Spathe* a dirty whitish or white-greenish, to 29-36 mm long, tubular for 28 mm, with a fenestrate apex, or bifid for 9 mm. *Flower* cernuous, to 39-43 mm long, 23-30 mm in its vertical diameter and 24-29 mm in its horizontal diameter. *Pedicel* ca. 26-38 mm long. *Ovary* cylindrical, brownish-green, to 5.9-8 mm long, 2.2-2.8 mm broad. *Perigone:* tepalsegs oblanceolate, connate for 1.4-1.5 mm, about 27-37 mm closely contiguous, a pale brownish-green, then obliquely spreading, white, slightly reddish on the outide; the outer to 41.5-45 mm long, 10.5-13.9 mm broad, sometimes marked with a green spot at the apex, the apiculum almost conical, ca. 0.5-1.5 mm long; the lateral outer pair slightly approximate to the lower inner, the lateral inner pair ca. 40.5-42.5 mm long, 6-8.7 mm broad, slightly approximate to the upper outer one, the lower inner about 41.5-44.5 mm long, 6-8 mm broad. *Stamens:* filaments whitish, somewhat incurved at the apex, lateral episepal pair to 7.5-10 mm long, upper episepal ca. 9-12 mm long, lower epipetal, about 18-19 mm long, lateral epipetal to 22-23 mm long. Anthers of two kinds, those of the episepal stamens flexuose-linear, to 8.5-11 mm long, those of the epipetal falcate-semilunate, ca 5-7 mm long; pollen yellow. *Style* declined or sometimes almost straight, to 29-30 mm long; stigma divisions recurved, ca 3-6 mm long.

Hab.—Dry, often more or less open, woods near Lumbreras, in the province of Salta, Argentina.

Habranthus saltensis has some exclusive features of great interest. Tepals show a tendency of arranging themselves in two groups, this circumstance accentuates the effect of bilateral symmetry. The lateral outer pair approaches to the lower inner, and the lateral inner to the upper outer one. Something similar occur in the genus *Griffinia*, but in this case the grouped tepals are five, being apart the lower inner.

Another interesting character is found in the dimorphism between the anthers of the episepal and epipetal stamens. Existing differences in size and shape, cannot be explained satisfactorily. This even considering the fact that the episepal stamens are included in the tube; the latter is composed of the tepals, which are closely contiguous for much of their length.

The enthomologist Antonio Martínez found this interesting species in the region of Lumbreras, Salta, about 5 km south from the "gasoduct" pumping-engine. Nevertheless, it seems frequent in other places, as for instance, in the neighborhood of Güemes. Additional specimens will be quoted, as soon as their identities are confirmed.

Habranthus spectabilis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 6. 1970.—Plant to 36 cm tall. *Bulb* obovate, ca. 30-35 mm long, 20-30 mm in diam., produced for 18-64 mm into a pseudo-neck, covered with dark brown, more or less rugose, coats. *Leaves* none at anthesis, probably linear. *Scape* cylindrical, to 20-27 cm long. *Umbel* one-flowered. *Spathe* membranous, ca. 29-43 mm long, tubulose for 16-21 mm, then bifid or rarely fenestrate. *Pedicel,* about 5-8.2 cm long. Flower lilac-pink on the outside, white inside, to 55-60 mm long, 45-50 mm broad. Perigone tepalsegs oblanceolate, connate for 3 mm, the outer about 60 mm long, 15-16 mm broad, apiculum 1-1.5 mm long, inner about of the same length, somewhat narrower, acute. *Stamens* filaments declined, the upper episepal to 14 mm long, lateral episepal pair ca. 18-20 mm long, lower epipetal to 26 mm long, lateral epipetal pair about 23-24 mm long. Anthers falcate-semilunate, about 5-7 mm long. Basal scales of stamens small, laciniate, ca. 1.4 mm long. *Ovary* narrowly obovate, probably obtusely trigonous, to 6-8 mm long, 2.2-3 mm broad. *Style* declined, to 36-38 mm long; stigma divisions recurved, ca. 3.7-6 mm long.

Hab.—Region of Ledesma, in the province of Jujuy, Argentina.

Habranthus spectabilis is apparently allied with *H. robustus* Herb. ex Sweet. However, the flower shape is more regular in the species here described. On the other hand, *H. robustus* belongs to a quite different ecological habitat, in the East side of the States of Santa Catarina and Paraná, in Brazil. It seems that *H. robustus,* has apparently escaped from cultivation in some places of the province of Misiones; this is a statement from people which has not been verified by me as yet.

[The following lines represent the translation from Dr. Vargas' article "Una nueva especie de Amaryllis del Sur de Perú", in *Biota* 7(65) : 1-3. 1970. It is noted that there must be a mistake or misprint in the measurements of the bulb. The stigma is obscurely defined as "trifidum, capitatum" (?). The figure is not precise enough as to clear up the latter point.—*P. F. Ravenna.*]

Amaryllis macbrideii Vargas, Biota 8(65) : 1-3. Fig. on page 2. 1970.

Bulb almost globose, depressed above, 8-9 cm in diam., 5.5 cm wide. Roots fascicled dense, 20-25 cm long. *Scape* 2-3 or more each bulb, about 26 cm long or more, cylindrical, ca. 15 mm in section at the base, 12 mm at the apex, subcompressed, green. *Flowers,* rarely 3, its *pedicels* greenish, 75 mm long; *bracts* two, lanceolate, green, overtopping the ovary; bracteoles 2, 12 mm long, greenish-white. *Perianth* white, flushed with pink and veined with greenish yellow, with a star of a dark green passing to greenish upwards. *Paraperigone* whitish-hyaline, 2-3 mm long, lacinied for 1 mm. Outer tepals ovate-lanceolate, 10 cm long, 4.8 cm broad at the middle, its apicules [as "apex unguiculatus", sic!] green, 2 mm long; inner tepals ovate-lanceolate, 10 cm long, 3.5 cm broad, not apiculate [as "unguiculata", sic!], lower inner tepal ["labellum", sic!] shorter. *Stamens* as long as segments, the filaments greenish-white for one third; anthers oblanceolate [?], after dehiscence 6.5 mm long; pollen yellow. *Style* exceeding the style for 20 mm; stigma trifid capitate; ovary subtrigonous, green, 20 mm long.

The preceding description was made in 1963 [by Dr. Vargas], upon living material; the bulbs were brought from Sandia, Dept. of Puno; they were cultivated at Urubamba, Cuzco, until the present with satisfactory results. The type-specimen agrees with the description in all perianth parts; nevertheless, it must be said that some plants showed narrower tepals, giving a wider appearance to the flower. I have dedicated the species to my faithful friend, J. Francis Macbride, author of "Flora of Peru", to whose stimulus and teaching, I owe most of my scarce knowledge on the Peruvian botany.

CORRIGENDA—See page vi, present issue, for Corrigenda, Ravenna article—Latin American Amaryllids, PLANT LIFE 27: pages 133 and 134. 1971.

PLANT LIFE LIBRARY—continued from page 68.

TREES: STRUCTURE AND FUNCTION, by Martin H. Zimmerman and Claud L. Brown. Springer-Verlag New York, 175 5th Av., New York, N. Y. 10010. 1971. Pp. 336. Illus. $19.80. This important new book is concerned with the aspects of tree physiology which is peculiar to tall woodly plants. The emphasis is on function as it relates to structure. Such a dynamic view concentrates on how trees grow, but not how growth is modified by differences in environment. The subject is developed under the headings—primary growth, secondary growth, growth and form, transport in the xylem, and phloem, the steady state thermodynamics of translocation in plants, and storage, mobilization and circulation of assimilates. This outstanding text is indispensable to all interested in the physiology of plants. Very highly recommended.

THE RUST FUNGI OF CEREALS, GRASSES AND BAMBOOS, by George Baker Cummins. Springer-Verlag of New York, 175 5th Av., New York, N. Y. 10010. 1971. Pp. 570. Illus. $19.50. This illustrated descriptive manual of the rust fungi (**Uredinales**) of the **Gramineae** provides the first world-wide coverage of the taxonomy and nomenclature of these important pathogens. The species are "keyed" first by genera of grasses, but the novel feature of this book is the attempt to produce a system whereby these pathogens may be recognized on the basis of their morphology. The number of species described number 419 in 7 genera, including the form genus **Uredo.** The species illustrated number 362. This is an indispensable manual for all interested in the **Gramineae.** Very highly recommended.

PROPAGATING HOUSE PLANTS, by Arno and Irene Nehrling Hearthside Press, 445 Northern Blvd., Great Neck, N. Y. 11021. 1971. Pp. 292. Illus. $6.95. This reprint of the 1962 edition of this valuable book on propagating house plants by two outstanding authorities will be welcomed by those who did not obtain a copy in the 1960's. It is to be noted that a new section on the culture of herbs and vegetables indoors has been added. The other sections are devoted to an introduction, how to propagate, aids in propagation, steps from window to greenhouse gardening, how to grow plants the easy way, dictionary of house plants, and propagation for special purposes. Highly recommended.

TROPICAL GARDENING, by Peggy Hickok Hodge. Charles E. Tuttle Co., Rutland, Vermont 05701. 1971. Pp. 129. Illus. $7.50. Subtitled a "Handbook for the Home Gardener", this attractive book is a revised 2nd edition of "Home Gardens in Hawaii". It is indicated that the ideas in the book can be adapted to other areas by following directions given for climate, weather, moisture, sun and rainfall. The sections in the book are devoted to popular Island ornamentals (Hibiscus, Ginger, etc.), outdoor plantings that show, flower beds, indoor plants and flowers, outdoor arrangements, trees for Hawaii, fruit in the garden, more things good to eat, and battle of the bugs. Recommended to those who garden in subtropical and tropical climates.

AUSTRALIAN NATIVE ORCHIDS IN COLOUR, by Leo Cady and E. R. Rotherham. Charles E. Tuttle Co., Rutland, Vermont 05701. 1971. Pp. 112. Illus. in color. $6.75. Following an instructive introduction, and a description of orchid flowers, the species in 37 genera of orchids are discussed; and the Subtribe Sarcanthinae and miscellaneous genera are considered. The text is beautifully illustrated in color, and these illustrations alone are worth more than the price of the book. Highly recommended to all interested in the orchids.

THE ORDER ALLIALES

HAMILTON P. TRAUB

It had long been known that laticifers are present in the tissues of *Allium* L. species (see Rendle, 1884, Menz, 1910, Hoffman, 1930, Mann, 1952, and others), but no attempts were made to determine the phylogenetic significance of this very unusual anatomical feature on a wider comparative basis in the one genus; also in relation to the other genera of the Family Alliaceae, and the other families assigned to the Order Liliales (Takhtajan, 1961, 1969; Cronquist, 1968).

For many years the writer did his best to interest graduate students in this fertile field of thesis material but there were no takers. Fortunately, out of the clear blue sky in 1967, Dr. Clarence Sterling of the Department of Food Science and Technology, University of California at Davis, wrote that he had a graduate student interested in studying the laticifers of *Allium* L. The writer took this opportunity to send not only bulbs of *Allium* L. species, but also to send stock of species in other genera of the Family Alliaceae, including *Caloscordum* Herb. (Eastern Siberia to Mongolia, China and Japan), *Nothoscordum* Kunth (Mexico and Chile), *Tristagma* Poepp. (Argentina), *Tulbaghia* L. (South Africa), add *Agapanthus* L'Herit. (South Africa), a selection which was calculated to give a wide-ranging insight into the phylogenetic significance of this unique anatomical feature, if present, on a comparative basis. The writer also suggested possible sources of *Hesperocallis* Asa Gray from southwestern United States; and species of *Leucocoryne* Lindl., from Chile, *Miersia* Lindl., from Chile and also *Brodiaea* J. E. Smith, and related genera, from the North American Pacific Coast, and *Milla Cav.*, and related genera from Mexico. Due to time limitations, the graduate student, as noted below, found it practicable to include only the genera *Allium, Caloscordum, Nothoscordum, Tristagma* and *Tulbaghia,* but this was sufficient to set a landmark, and lay the foundation for progress in this field.

When the results were in, the editors of the American Journal of Botany published only the part concerning *Allium* L. (see Huang & Sterling, 1970). These are significant results in a number of directions. Previously Traub (1968a, 1968b) had recognized the subgenera *Amerallium* and *Allium* in the Genus *Allium* L. on the basis of chromosome number and the distribution of the vascular bundles in the leaves of *Allium* L. species. The validity of these conclusions was corrobated by Huang & Sterling (1970) on the basis of the depth at which the laticifers are located in the leaves of *Allium* species. The reader should consult the original article (Huang & Sterling, 1970) for more details about this subject, and other results obtained.

Since the results concerning the other genera—*Caloscordum, Nothoscordum, Tristagma,* and *Tulbaghia*—were not published, the writer as editor offered to publish these. They appear in the article by Sterling & Huang (1972) in the present issue of PLANT LIFE. These show that laticifers are present in all of the genera investigated, ranging from the Northern Hemisphere to South America and South Africa, and reveal that the group is well-defined and unique on the basis of laticifer anatomy.

In the subfamily Allioideae as recognized up to the present (Traub, 1970), it is known that the alliaceous scent is present when the tissues are broken in *Hesperocallis undulata* and *Milula spicata,* and is widespread in the subfamily as a whole. In the Genus *Allium* L. apparently *A. nigrum* L. and several other species are without this scent, and similarly species of *Tulbaghia* L. have the alliaceous oder except *T. fragrans* Verd. Similar conditions are found in *Leucocoryne, Tristagma, Nothoscordum,* and species of the Tribe Gilliesieae. This leads to the conclusion that when this feature is lacking, it has been lost through evolution. Thus, on the basis of the presence of the alliaceous scent, this group is unique in the plant subkingdom.

In addition to the alliaceous scent, the presence of laticifers has now been shown to be widespread in the Family Alliaceae, a unique anatomical feature when considered in connection with the other families included under the Order Liliales up to the present. As pointed out by Eames (1961), in connection with the presence of laticifers in the Alismatales (Limnocharitaceae and Alismataceae), that such an important anatomical feature cannot be ignored when phylogenetic relationships are considered. Thus, it was necessary to recognize the Alliaceae as a very distinct group under the Order Alliales (Traub, 1971).

In the case of the Order Alliales it is not necessary to reconstruct a hypothetical first alliad because the Alliales include also the ''living fossils'' (see Traub, 1968b, 1970), the raceme bearing *Hesperocallis undulata* Asa Gray ($2n=48$), from the southwestern United States (Rountree, 1941; Traub, 1970), and the spicate *Milula spicata* Prain, ($2n=?$) from Tibet and Nepal (Prain, 1895, 1896, Stearn, 1960, Traub, 1963, 1970). Both have to be included in the Alliales due to the biochemical marker of the alliceous scent when the tissues are broken, as well as some gross morphological features. These are relicts apparently representing relatively primitive living descendants of the extinct primitive line from which the well-known species of the Alliaceae also evolved. These ''living fossils'' cannot be united with the more advanced Family Alliaceae and have to be recognized for what they are—distinct relict families, each having evolved in a different direction, and each with only a single surviving relict species. *Hesperocallis undulata* is apparently nearest to the extinct primitive line. The basal leaves plus *leafy stem,* and *racemose inflorescence* are relatively primitive. The line may even have continued from the original alliads *with evolution* in an unbroken sequence to *Hesperocallis undulata.* However, the bulbous rootstock, the perigone united below into a tube, stamens inserted at the throat, syncarpous ovary and capsule, are relatively advanced characters, showing continued parallel evolution along the later alliad pattern—similarities developed in two or more lineages of common ancestry, and on the basis of, or channeled by, the characteristics of that ancestry (Traub, 1964).

The Order Alliales thus consists of three families—Hesperocallaceae, Milulaceae and Alliaceae, including 6 tribes, 32 genera, and over 800 species. The Order is summarized below:

Order **ALLIALES** Traub, **ord. nov.**, (Monocotyledones); Traub, in Lily Order—Liliales, in Encyc. Brit., new ed in prep., article **(anglice)** submitted 1971.
Caudex plerumque bulbosus interdum rhizomatosus vel cormasus; glandulae laticiferae in texturis totarum plantarum investigatarum ad sunt; odor alliaceus saepe adest ubi texturae fracta sunt; folia plerumque basales; inflorescentia racemosa spicatave umbellatave; ovarium superum; perigonium 6- (raro 5- vel 3-) partitum; stamina 6 vel raro 3 vel 2; fructus capsularis trilocularis loculicidalis; semina in quoque loculo 1 vel 2 (interdum plus numerosa).
Typus: Family **Alliaceae** Agarth (1858)
Family 1. **HESPEROCALLACEAE** Traub, **fam. nov.**
Caudex bulbosus; folia principales basales; caulis erectus, in parte inferiori folias paucas breviores gerens; inflorescentia racemosa, bracteis flores fragrantes subtentis; pedicelli ad apicem articulati; perigonium infra medium connatum (= tubis tepalorum), supra medium 6-divisum (= segmentis tepalorum); stamina 6 in fauce inserta; ovarium superum triloculare; stigma discoideum; capsula loculicidalis; semina numerosa nigra complanata.
Typus: Genus **Hesperocallis** Asa Gray (1868)
Tribe 1. **HESPEROCALLEAE** Traub, in Plant Life 24: 50. 1968; Traub, in intro. Herb. Amaryll. 1970, pp. 79-80. Nomenifer: Genus **Hesperocallis** Asa Gray (1868)
1. **Hesperocallis** Asa Gray (1868)

Family 2. **MILULACEAE** Traub, **fam. nov.**
Caudex bulbosus; folia linearilanceolata; scapus aphyllus; spatha monophylla; inflorescentia spicata, spica densa cylindrica, flosculis omnis per bracteam ovalem subtentus; perigonium infra connatum (=tubus tepalorum), supra 6-divisum (=segmenti tepalorum); stamina 6, filamentis 3 exterioribus infra dilatatis et breviter bidentatis, dentibus lateralibus; ovarium superum triloculare, ovulis in quoque loculo 2; capsula loculicidalis; semina oblonga nigra
Typus: Genus **Milula** Prain (1895)
Tribe 2. **MILULEAE** (Prain) K. Krause (1930). Nomenifer: Genus **Milula** Prain (1895)
2. **Milula** Prain (1895)

Family 3. **ALLIACEAE** Agarth (1843). Nomenifer: Genus **Allium** L. (1753)
Subfamily 1. **ALLIOIDEAE** Engler (1887), syn.- Infrafamily **Allioidinae** Traub, in Plant Life 24: 50. 1968.
Tribe 3. **ALLIEAE** Kunth (1843)
Subtribe 1. **ALLINAE** Traub (1963)

3. **Allium** L. (1753)
4. **Caloscordum** Herb. (1844)
5. **Steinmannia** R. A. Phil. (1844)
6. **Nothoscordum** Kunth (1833)
7. **Leucocoryne** Lindl. (1830)
8. **Tulbaghia** L. (1771)
9. **Tristagma** Poepp. (1833)

Subtribe 2. **AGAPANTHINAE** (Endl.) Traub, **comb. nov.** Syn.- Tribe **Agapantheae** Endl., Gen. Pl. 111-113. 1836.
10. **Aganpanthus** L'Herit. (1788)
Tribe 4. **GILLIESIEAE** Lindl. (1826)

11. **SCHICKENDANTZIELLA** Speg. (1903)
12. **SPEEA** Loeser (1927)
13. **MIERSIA** Lindl. (1826)
14. **GETHYUM** R. A. Phil. (1873)
15. **GILLIESIA** Lindl. (1826)
16. **SOLARIA** R. A. Phil. (1857)
17. **ERINNA** R. A. Phil. (1864)
18. **TRICHLORA** Bak. (1877)
19. **ANCRUMIA** Harv. ex Bak. (1877)

Subfamily 2. **BRODIAEOIDEAE** Traub, **subfam. nov.**, Rhizoma cormiformi; floribus regularribus; ovario ad apicem pedicelli vel in gynophoro gerente; staminibus certis 6 vel 3. Typus: Genus **Brodiaea** J. E. Smith (1811)
Tribe 5. **BRODIAEEAE** Traub, Plant Life 24: 49. 1968, **ibid. 25**: 48. 1969.

20. **MUILLA** S. Wats. (1879)
21. **BLOOMERIA** Kell. (1863)
22. **TRITELEIA** Dougl. Ex Lindl. (1830)
23. **DICHELOSTEMMA** Kunth (1843)
24. **BRODIAEA** J. E. Smith (1811)
25. **TRITELEIOPSIS** Hoover (1941)
26. **ANDROSTEPHIUM** Torr. (1858)

Tribe 6. **MILLEAE** Traub, In Plant Life 24: 49. 1968, **ibid. 25**: 48. 1969.

27. **DANDYA** H. E. Moore
28. **BESSERA** Schult. f. (1829)
29. **BEHRIA** Greene (1886)
30. **PETRONYMPHE** H. E. Moore (1951)
31. **MILLA** Cav. (1793)
32. **DIPHALANGIUM** Schauer (1847)

LITERATURE CITED

Cronquist, Arthur. The evolution and classification of flowering plants. Houghton, Mifflin Co., 1961.

Eames, Arthur J. Morphology of the angiosperms. McGraw-Hill. 1961.

Huang, Shiu-mei and Clarence Sterling. Laticifers in the bulb scales of **Allium.** Amer. Jour. Bot. **57:** 1000-1003. 1970.

Mann, L. K. Anatomy of the garlic bulb and factors affecting bulb development. Hilgardia **21:** 195-251. 1952.

Hoffman, Charles Andrew. Developmental morphology of **Allium cepa.** Bot. Gaz. **95:** 279-299. 1933.

Menz, Johanna. Beitraege zur vergleichenden Antomie der Gattung **Allium,** etc. Akad. der Wiss. Wien, Math.-Nat Kl. Stizber. Abt. 1, 119(1): 475-533. 1910.

Prain, D. On **Milula,** a new genus of Liliaceae from the Eastern Himalaya. Sci. Mem. Med. Off. Army India **9:** 25-27, pl. 1. 1895.

——. The same. Ann. Roy. Bot. Gard. Calcutta **5:** 165-166, pl. 200. 1896.

Rendle, A. B. On the vescular vessels of the onion. Ann. Bot. **3:** 169-177. 1889.

Rountree, Lester. The Desert Lily, **Hesperocallis undulata.** Herbertia **8:** 149-152, pl. 219. 1941.

Stearn, W. T. **Allium** and **Milula** in the central and eastern Himalaya. Bull. Brit. Mus. (Nat. Hist.) Bot. **2:** 11—119. 1960.

Sterling, Clarence and Shiu-mei Huang. Notes on the laticifers of **Allium, Caloscordum, Nothoscordum, Tristagma** and **Tulbaghia.** Plant Life **28:** 43—46. 1972.

Takhtajan, Armen. The origin of angiospermous plants. 2nd ed. (Russian), Moscow. 1961.

——. Flowering plants: Origin & Dispersal. Smithsonian Inst. Wash. D. C. 1969.

Traub, Hamilton P. The Genera of Amaryllidaceae. The American Plant Life Society, La Jolla, Calif. 1963, p. 31.

——. Lineagics. The American Plant Life Society, La Jolla, Calif. 1964.

——. Orientation of vascular bundles in **Allium** leaves. Plant Life **24:** 143-146. 1968a.

——. The subgenera, sections and subsections of **Allium** L. Plant Life, **24:** 147-163. 1968b.

——. Introduction to Herbert's Amaryllidaceae, and related works. [93 pp.] Issued separately, and with the facsimile reprint of Herbert's Amaryllidaceae, 1837. Verlag von Cramer, Lehre, West Germany. 1970.

——. [Order Alliales], in Lily Order—Liliales. In Encyc. Brit. new ed. in prep., article submitted in 1971.

GENUS **ALLIUM** L.—SUBGENERA, SECTIONS AND SUBSECTIONS

HAMILTON P. TRAUB

ABSTRACT

The grouping of the **Allium** L. species under the three subgenera—**Amerallium, Nectaroscordum** and **Allium**—on the basis of basic chromosome numbers (Traub, 1968c) has been corroborated by the reported results on the orientation of the leaf vascular bundles (Mann, 1962, Traub 1968b) and the structure and distribution of the bulb scale or leaf laticifers (Mann, 1962, Huang & Sterling, 1970, and Sterling & Huang, 1972).

Since the publication of the article on the subgenera, sections and subsections of *Allium* L. (Traub, 1968c), additional evidence to corroborate the subgeneric grouping has appeared in the literature. The purpose of the present brief paper is to consider this new evidence as it bears on the previous findings and the linordination of the subgeneric groups of *Allium* L.

I. BASIC CHROMOSOME NUMBERS

Originally, Traub (1968c) grouped the species of *Allium* L. under three subgenera—*Amerallium, Nectaroscordum* and *Allium*—solely according to the basic chromosome numbers and the number of floral tepal nerves.

1. *SUBG. AMERALLIUM.* The subgenus *Amerallium* includes two related geographical groups with 1-nerved floral tepals. (a) North American *Allium* species, which have been almost all sampled, are revealed as having the basic x-7 chromosome number. These include almost all of the Allium species native to North America. (b) A lesser number of Old World species, with the basic $x=7$ chromosome number, and with few exceptions having $x_2=8$ or $x_3=9$ basic numbers,

apparently belong here. These Old World exceptional species apparently are the result of a relatively recent evolution from $x=7$ species since $x=7$ and $x_3=9$ numbers, for instance, appear in the same species, *A. pendulinum* Ten., $2n=14, 18$. Also as indicated under article sections 2 and 3 below, the vascular bundle orientation in the leaves, and the distribution of the laticifers in the bulb scales are similar to those found in the species with the $x=7$ basic chromosome number.

2. *SUBG. NECTAROSCORDUM.* This very small group with 2 or 3 species, ranging from southern France to Iran, including species having the basic $x_2=8$ basic chromosome number, and (1)—3—7-nerved floral tepals, is confined to the Old World as indicated.

3. *SUBG. ALLIUM.* The residual Subgenus *Allium,* with 1-nerved tepals, includes two related geographical groups. These two groups as a whole have been sampled to a fair extent for chromosome numbers. (a) The small North American group includes *A. tricoccum* Ait., $2n=32$, confined to eastern North America, and *A. victorialis* L. ssp. *platyphyllum* Hult., $2n=32$, confined to extreme western Aleutian Is., both in the Section *Anguinum* G. Don, a distinctly Old World Section; and *A. schoenoprasum* L. var. *sibiricum* (L.) Hartm., $2n=16, 32$, ranging widely over northern North America, belonging to Section *Cepa* (Moench) Prokanov, again, a distinctly Old World section. (b) The second very large group includes the bulk of the Old World species with the basic $x_2=8$, $x_3=9$ or $x_4=10$ chromosome numbers.

2. VASCULAR BUNDLE ORIENTATION IN LEAVES

The results presented (Mann, 1962, Traub, 1968b) show that in the case of the Subgenus *Amerallium* (with 1-nerved floral tepals), and with the basic $x=7$ chromosome number, with few exceptions as indicated under article Section 1, above; and Subgenus *Nectaroscordum,* with (1)—3—7-nerved floral tepals, and the $x_2=8$ basic chromosome number, the leaf blade vascular bundles in cross section are in one row, with few exceptions. In contrast, in Subgenus *Allium,* with 1-nerved tepals, and $x_2=8$, $x_3=9$ or $x_4=10$ basic chromosome numbers, the leaf blade vascular bundles are in two opposing rows or in a circle. Thus, the grouping (Traub, 1968c) has been corroborated.

3. DISTRIBUTION OF LATICIFERS IN BULB SCALES

It has been shown by Mann (1962), Huang & Sterling (1970) and Sterling & Huang (1972) that the laticifers in Subgenera *Amerallium* and *Nectaroscordum* are hypodermal in the bulb scales whereas in Subgenus Allium they occur in the second layer below the epidermis or deeper. Again, the grouping (Traub, 1968c) has been verified.

4. CATEGORY LEVELS UNDER GENUS ALLIUM L.

Separating the species in a very large genus such as *Allium* L. with 600+ species into subgenera as *far as warranted* is an important step towards understanding such a diverse assemblage. However, a subgenus is nearing the generic level, and should not be based on minor gross morphological differences because that would not give a natural or evolutionary grouping. The subgroups should be meaningful and should be based as in the present case on fundamental differences such as (a) the primary (x), secondary (x_2), tertiary (x_3), and quadrinary (x_4) basic chromosome numbers; (b) the orientation of leaf blade vascular bundles, (c) the depth of the bulb scale laticifers, as indicated above, and still other fundamental characters, if available. If further subdivisions are necessary at lower category levels (Traub, 1964, 1968b, 1968c) these may be based on less fundamental features, such as the rhizomatic or bulbous rootstock, differences in bulb coats, differences in the umbellate inflorescence, structure of the stamen-filiments, and many other such characters.

The decreasing levels of categories are as follows:

Genus
Subgenus
Infragenus, if needed
Section
Subsection
Alliance, if needed

In the following summary key, the categories *subgenus, section* and *subsection* are considered as sufficient.

5. SUBGENERA, SECTIONS AND SUBSECTIONS OF ALLIUM L.

1a. Species (a) with leaf blade vascular bundles in one row, with few exceptions, (b) with hypodermal laticifers in the bulb scales, and (c) with the basic $x=7$ chromosome number, with few exceptions, $x_2=8$ and $x_3=9$ in number, in such cases the features indicated under (a) and (b) are present.

2a. Tepals 1-nerved:

SUBGENUS I. AMERALLIUM Traub

Plant Life 24: 159-161. 1968; nomenifer: **A. canadense** L. **2n=14, 28.**

3a. North American species; basic chromosome number $x=7$, leaf blade vascular bundles in one row, with few exceptions, and hypodermal laticifers of bulb scales:

SECTION I. CAULORHIZIDEUM Traub, nomenifer: **A. validum** S. Wats., **2n=28, 56.** Plant Life **23**: 69. 1967: **ibid. 24** 156-157. 1968.

SECTION II. AMERALLIUM. Nomenifer: A. canadense L., **2n=14, 28.** Plant Life **23**: 89-95. 1967; **ibid. 24**; 160. 1968.

SUBSECTION 1. MEXICANA Traub. Nomenifer: **A. mexicanum** Traub, **2n=?** Plant Life **23**: 89-95. 1967; ibid. **24**; 135, 160. 1968.

SUBSECTION 2. CANADENSIA Ownbey ex Traub, nomenifer: **A. canadense** L. **2n=14, 28.** Plant Life **23**; 89, 95. 1967; ibid **24**; 160. 1968.

SECTION III. LOPHIOPRASON Traub, nomenifer: **A. sanbornii** Wood, **2n=14.** Plant Life **23**: 69. 1967, **ibid. 24**: 160. 1968.

SUBSECTION 1. FALSIFOLIA Ownbey ex Traub, nomenifer: **A. falsifolium** Hook. & Arnott; **2n=14.** Plant Life **23**: 69. 1967; **ibid. 24**; 160. 1968.

SUBSECTION 2. CERNUA Ownbey ex Traub, nomenifer: **A. cernuum** Roth & Roem., **2n=14.** Plant Life **23**; 69, 1967; **ibid.**

24: 160. 1968.

SUBSECTION 3. SANBORNIANA Ownbey ex Traub, nomenifer: **A. sanbornii** Wood, **2n=14.** Plant Life **23**; 69. 1967, **ibid. 24**; 160. 1968.

SUBSECTION 4. ACUMINATA Ownbey ex Traub, nomenifer: **A. acuminatum** Hook., **2n=14.** Plant Life **23**; 69. 1967 **ibid.** 24: 161. 1968.

SUBSECTION 5. CAMPANULATA Ownbey ex Traub, nomenifer: **A. campanulatum** S. Wats. **2n=14.** Plant Life **23**: 69. 1967, **ibid. 24**: 161. 1968.

SUBSECTION 6. BOLANDERIANA Traub, nomenifer: **A. bolanderi** S. Wats. **2n=14.** Plant Life **23**; 69, 1967. **ibid. 24**; 161. 1968.

SECTION IV. RHOPHETOPRASON Traub, nomenifer: **A. glandulosum** Link & Otto, **2n=28.** Plant Life **23**: 110. 1967, **ibid. 24**: 141, 161. 1968.

3b. Old World species; basic chromosome number almost always $x=7$, except $x_2=8$ or $x_3=9$ in a few instances, and then the leaf blade vascular bundles are in one row, and laticifers in the bulb scales are hypodermal:

4a. Scape **not** triquetrous:

SECTION V. MOLIUM Endl. (1836) nomenifer: **A. neapolitanum** L. **2n=14, 28.** Syn.—**A. moly** L. **2n=14, 28.** Plant Life 24: 161. 1968.

5a. Floral umbel **not** nesting in center of the prostrate leaves:

SUBSECTION 1. MOLIANA. nomenifer: **A. neapolitanum** L. **2n=14, 28.** Plant Life **24**: 146. 1968. sphalm.; **ibid. 27**: iv. 1971.

SUBSECTION 2. XANTHOPRASA (F. Hermann) Traub, **comb. nov.** syn.—Section **Xanthoprason** F. Hermann, Fedde Rep. 46: 57-58. 1939; nomenifer: **A.** moly L., **2n=14**; Plant Life **24**: 146, sphalm., 1968. **ibid. 27**; iv. 1971.

5b. Floral umbel **nesting** in the center of the prostrate leaves; minute species, leaves 4, narrow, umbel 4-fld, fls. white:

SUBSECTION 3. CHAMAEPRASA (F. Hermann) Traub, **comb. nov.** Syn.—Section **Chamaeprason** F. Hermann, Fedde Rep. 46: 57-58. 1939, nomenifer: **A. chamaemoly** L. **2n=?** Plant Life **24**: 146. 1968.

4b. Scape triquetrous:

SECTION VI. OPHIOSCORODON (Wallr.) Endl. (1836); nomenifer: **A. ursinum** L. **2n=28.** Plant Life **24**: 161. 1968.

6a. Leaves oblong, acuminate at both ends:

SUBSECTION 1. URSINA Traub, Plant Life **24**: 161. 1968. nomenifer: **A. ursinum** L. **2n=14.**

6b. Leaves petiolate, blade sharply keeled; stamen-filaments very narrow, inserted in two series; seeds arillated:

SUBSECTION 2. TRIQUETRA Traub, Plant Life **24**: 161. 1968, nomenifer: **A. triquetrum** L. **2n=18.** Note also **A. pendulinum** Ten., **2n=14, 18; A. paradocum** (M. B.) G. Don, **2n=16.**

2b. Tepals (1)—3—7-nerved; seeds 8—11 per locule; pedicels often markedly discoidally swollen at the paex: basic chromosome number as far as known $x_2=8$.

SUBGENUS II. NECTAROSCORDUM (Lindl.) Traub

Plant Life 24: 162. 1968. Syn.—Genus **Nectaroscordum** Lindl. Bot. Reg. 9: pl. 1912. 1836. Nomenifer: **A. siculum** Ucria, **2n=16.**

SECTION VII. NECTAROSCORDUM

1b. Species with (a) leaf-blade vascular bundles in 2 opposing rows, or in a circle, with few exceptions, (b) laticifers in the bulb scales occur in the second layer below the epidermis or lower, (c) with $x_2=8$, $x_3=9$, $x_4=10$ basic chromosome numbers; and (d) tepals 1-nerved. All Old World taxa, except **Allium tricoccum** Ait., native to eastern North America, and **A. victorialis** L. ssp. **platyphyllum** Hult., confined to extreme western Aleution Is., both in Sect. **Anguinum;** and **A. schoenoprasum** var. **sibiricum** L. Hartm. (Sect. Cepa), ranging over much of northern North America.

SUBGENUS III. ALLIUM.

Plant Life 24: 162. 1968. Nomenifer: **A. sativum** L. **2n=16, 48.**

7a. Leaves **not** fistulose:

8a. Leaves oval or petiolate:

SECTION VIII. ANGUINUM G. Don ex Koch (1837); nomenifer: **A. victorialis** L. **2n=16, 32.**

8b. Leaves **not** oval or petiolate:

9a. Umbel more than 2-flowered:

SECTION IX. RHIZIRIDEUM G. Don ex Koch (1837); nomenifer **A. senescens** L. **2n=32, 48.**

SUBSECTION 1. TUBEROSA, nomenifer: **A. tuberosum** Rott. ex Spreng. **2n=16, 32.**

SUBSECTION 2. INDERIENSIA, nomenifer: **A. indieriense** Fisch. ex Bunge, **2n=?).**

SUBSECTION 3. SENESCENSIA, nomenifer: **A. senescens** L. **2n=32, 48.**

SUBSECTION 4. SIKKIMENSIA, Nomenifer: **A. sikkimense** Bak. **2n=32.**

SECTION X. MELANOCROMMYUM, Webb & Berth. (1843), nomenifer: **A. nigrum** L. **2n=16.**

SECTION XI. CONDONOPRASON (Rchb.) Endl. (1836) nomenifer: **A. oleraceum** L. **2n=32, 40.**

SECTION XII. PETROPRASON F. Hermann (1939), nomenifer: **A. obliquum** L. **2n=16.**

SECTION XIII. ALLIUM, nomenifer: **A. sativum** L. **2n=16.**

SECTION XIV. HAEMOPRASON F. Hermann (1939); nomenifer: **A. melanantherum** Panc. **2n=?.**

9b. Umbel 1-, rarely 2-flowered; plant small, delicate, slight alliaceous odor; leaves 1—2, nesting on the ground; style 3-lobed nearly to the middle:

SECTION XV. MICROSCORDUM Maxim. (1887); nomenifer: **A. monanthum** Maxim. **2=16, 32.**

7b. Leaves **fistulose:**

SECTION XVI. CEPA (Moench) Prokh. (1931); nomenifer: **A. Cepa** L. **2n=16, 32.**

SUBSECTION 1. CEPA; nomenifer: **A. cepa** L. **2n=16, 32.**

SUBSECTION 2. FISTULOSA; nomenifer: **A. fistulosum** L. **2n=16.**

SUBSECTION 3. SCHOENOPRASA, nomenifer: **A. schoenoprasum** L. **2n=16, 32.**

SUBSECTION 4. POPOVIANA, nomenifer: **A. popovii** Vved. **2n=16.**

LITERATURE CITED

Huang, Shiu-Mei, and Clarence Sterling. Laticifers in bulb scales of **Allium** Amer. Jour. Bot. **57:** 1000-1003. 1970.

Mann, L. K. "Section of leaf (fresh) shows laticifers adjacent to epidermis and single row of vascular bundles in **Allium bulgaricum** (Janka) Prodan," [Subg. **Nectaroscordum**], [dated] "April 11, 1962", from Notes, in Dept. of Vegetable Crops, Univ. Calif., Davis.

Sterling, Clarence and Shiu-Mei Huang. Notes on the laticifers of **Allium, Caloscordum, Nothoscordum, Tristagma** and **Tulbaghia.** Plant Life **28**: 43-46. 1972.

Traub, Hamilton P. Lineagics. La Jolla, Calif. 1964.

——————. New Guatemalan and Mexican Alliums. Plant Life **24**: 127-142. 1968a.

——————. Orientation of vascular bundles in **Allium** leaves. Plant Life **24**: 143-146. 1968b.

——————. [Postscript—Section **Molium**]. Plant Life **24**: 146, 1968c-1; **ibid. 27**: Corrigenda. iv. 1971.

——————. The subgenera, sections and subsections of **Allium** L. Plant Life **24**: 147-163. 1968c.

TRIBE HOSTEAE, FAMILY AGAVACEAE

HAMILTON P. TRAUB

The work of McKelvey & Sax (1933), Whitaker (1934), Sato (1935) and Granick (1944) taken together has shown that the species of the Tribes Yucceae and Agaveae, Family Agavaceae, have a unique basic chromosome complement, n=5 large + 25 small chromosomes. That this chromosome complement is very stable is demonstrated by the fact that polyploid species with multiples of the basic number exist. *Hosta* has a similar chromosome complement. The chances against the evolution of a similar complement in another unrelated line are very great, and it is assumed that species of *Hosta* are related to the species of the tribes *Yucceae* and *Agaveae.* Apparently species of *Hosta* were once more widely distributed (see Granick, 1944) and are Agavaceae that evolved in a humid climate. In contrast, the *Yucceae* and *Agaveae* evolved in a xerophytic climate. This apparently accounts for the morphological differences between them as suggested by Traub (1953), who proposed the Tribe *Hosteae,* Family Agavaceae. Darlington and Wylie (1956) on the basis of chromosome similarity concurred in this conclusion.

Tribus *Hosteae* Traub, *tribus nov.,* Family Agavaceae Endl. (1841); Traub Plant Life 9: 134-137. 1953, *anglice.*

Herbae perennes, rhizomatibus lignosis, folis petiolatis, floribus bisexualibus albis vel caeruleis tubaeformibus vel campanulatis racemosis, racemis brevibus laxis scapo terminantibus; ovario supero; fructu capsulari; seminibus alatis. Typus: Genus *Hosta* Tratt. (1812).

LITERATURE CITED

Darlington, C. D. and A. P. Wylie. Chromosome Atlas of Flowering Plants. Macmillan. 1956. See pp. viii & xvii, and p. 395, for placement of *Hosta* with the Agavaceae.

Granick, E. B. A karyosystematic study of the genus *Agave*. Amer. J. Bot. 31: 283-343. 1944.

McKelvey, S. D. & K. Sax. Taxonomic and cytological relationships of *Yucca* and *Agave*. J. Arnold Arboretum 14: 76-80. 1933.

Sato, D. Analysis of the Karyotypes in *Yucca, Agave* and related genera with special reference to the Phylogenetic significance. Jap. J. Genetics 11: 272-278. 1935.

Traub, Hamilton P. The Tribes and Genera of the Agavaceae. Plant Life 9: 134-137. 1953.

Whitaker, Thomas W. Chromosome constitution in certain Monocotyledons. J. Arnold Arboretum 15: 135-143. 1934.

ORIGIN OF EUKARYOTIC CELLS, by Lynn Margulis. Yale Univ. Press, 92A Yale Station, New Haven, Conn. 06520. 1970. Pp. xxii + 349. Illus. $15.00. This attractively produced book, extensively and beautifully illustrated, is concerned with the hypothesis of the symbiotic origin of chloroplasts and mitrochondria in eukaryotic cells. This hypothesis is not new. However, the author is to be congratulated for bringing it up-to-date. Much of her argument is grounded on interpretations of cytoplasmic inheritance data. In the scientific frame of reference, the author agrees that if the hypothesis is correct it "provides new ways of looking at microbial evolution during vast stretches of Precambrian time. It will require altering the simplistic view that animal cells are more complex **Escherichia coli** and accepting the concept that they are a trigenomic complex (nucleus, mitrochondria, and (9 + 2) homologue) that has been evolving as an entity for more than 600 million years." If it is not correct, "it will at least provide a framework on which to place much of the immense amount of raw experimental data continuously published." And for this service alone, this book is most valuable. Thus, it is agreed that the hypothesis may or may not be true, and as pointed out by Stanier (1970), it appears that "we shall surely never know with certainty." He also emphasizes that such speculation is in the nature of metascience, and if it does not become an obscession it may serve a useful purpose. On that basis Dr. Margulis' book is highly recommended to all who are interested in biology.—**Hamilton P. Traub.**

LITERATURE CITED

Stanier, R. Y. Some aspects of the biology of cells and their possible evolutionary significance. Pp. 1—38, Plates 1—3, In, H. P. Charles & B. C. J. G. Knight, editors, Organization and control in prokaryotic and eukaryotic cells. Cambridge Univ. Press, 1970.

PLANT LIFE LIBRARY

CHEMOTAXONOMIE DER PFLANZEN, by R. Hegnauer. Five volumes of this very important series have now appeared as indicated below:

VOL. 1. THALLOPHYTEN, BRYOPHYTEN, PTERIDOPHYTEN UND GYMNOSPERMEN, by R. Hegnauer. Birkhauser Verlag, P. O. Box CH-4010, Basel, Switzerland. 1962. Pp. 517. Illus. sfr. (Swiss francs) 106.00. In this first volume, Dr. Hegnauer presents a general introduction to the entire series which is to cover the families of plants. The author also presents a comprehensive bibliography of the available literature on plant systematics, and anatomy, chemical composition, phytochemical surveys, and reports on the useful (economic), medicinal and poisonous plants of the world. The rest of the volume is devoted to the chemotaxonomy of the Thallophytes, Bryophytes, Peteridophytes and Gymnopserms, including sections on the systematic arrangement and anatomical characteristics, and summary of observations for each family. A comprehensive index completes the volume. It is evident at once that this book is indispensable to all interested in the taxonomy of plants, and it is very highly recommended.

The readers of PLANT LIFE will remember that VOLUME 2. MONOCOTYLEDONEAE. 1963: VOLUME 3. DICOTYLEDONEAE PART 1, ACANTHACEAE TO CYRILLACEAE. 1964; and VOL. 4. DICOTYLEDONEAE [PART 2] DAPHNIPHYLLACEAE TO LYTHRACEAE. 1966, have been previously reviewed in PLANT LIFE. These volumes may be obtained from Birkhauser Verlag; address as given above.

CHEMOTAXONOMIE DER PFLANZEN, VOL. 5. DICOTYLEDONEAE [PART 3], MAGNOLIACEAE TO QUIINACEAE. by R. Hegnauer. Birkhauser Verlag, P. O. Box CH-4010, Basel, Switzerland. 1969. Pp. 506. Illus. sfr. (Swiss francs) 106.00. In this 5th volume, the 61 families of flowering plants beginning with the interesting Magnoliaceae and ending with the Quiinaceae, are considered in detail on the basis of systematic arrangement, and anatomical and chemical characteristics. Information which became available after the main text was completed is included in a supplement. A comprehensive index completes the volume. This important book is a mine of information for all who are interested in the systematics of plants, and cannot be too highly recommended.

SELECTARUM STIRPIUM AMERICANARUM HISTORIA, by Nicolai Josephi Jacquin. Facsimile of the 1763 edition, with an introduction by Frans A. Stafleu. Hafner Publ. Co. 866 Third Av., New York, N. Y. 10022. 1971 Vol. I. Text. Pp. F32, (x), vii, (v), 284, (14). Vol. II 183 Plates. $62.50.

Jacquin was among the first to adopt the artificial Linnean system for classifying plants and his Selectum Stirpium Americanarum Historia, 1763 edition, represents the most important work dealing with his American plant collections. The 435 plants described are mostly new species or species which had so far not been described according to the Linnean system. These plants are native to Cuba, Jamaica, Haiti and other lesser West Indian Islands, and Venezuela. Several new genera are proposed. The 183 adequate illustrations are from copper engravings from drawings made by Jacquin himself in the field and based on living specimens. An important feature that accompanies this facsimile reprint is the Introduction by Dr. Stafleu. It includes a brief biography of Jacquin, an inventory of his collections, and publications, a translation of Jacquin's Preface to the 1763 edition, the botanical explorations of the Caribbean before Jacquin, and abbreviations and references in Jacquin's work. Very highly recommended.

FOUNDATIONS OF PLANT GEOGRAPHY, by Stanley A. Cain. Facsimile of the 1944 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022. 1971. Pp. ix=556. Illus. $11.95. Written as "an inquiry into the foundations of the science of plant geography", this important book by an outstanding authority, has served as a reference source since it was first published in 1944. The subject is presented in five parts, plant geography as a borderline science, aerography, evolution and plant geography, and the significance of polyploidy in plant geography. The reprint edition will be welcomed by all who did not have the opportunity of obtaining a copy of the original edition. Very highly recommended.

THE NATURAL PHILOSOPHY OF PLANT FORM, by Agnes Arber. Facsimile of the 1950 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022, 1970. Pp. 247. Illus. In this stimulating book Arber attempts to discuss the morphology of flowering plants on a tentative and provisional basis the modes of thought which are characteristic of philosophy rather than biology. She defines the term morphology to include both form and function. The subject is developed under the headings—meaning and content of morphology, plant morphology of the Aristotelian school, of Albertus Magnus and Andrea Cesalpino, Joachim Jung, Goethe and de Candolle; the organization type, the partial-shoot theory of the leaf, the urge to whole-shoot-hood in the leaf, bearing of partial-shoot theory of leaf on other morphological problems, repetitive branching and the Gestalt type, the mechanism and the interpretation of plant morphology. Those who did not obtain a copy of the original 1950 edition will be grateful of this opportunity for securing this outstanding book in this attractive reprint edition. Very highly recommended.

THE ALGAE OF ILLINOIS, by Lewis Hanford Tiffany and Max Edwin Britton, Facsimile of the 1952 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022, 1971. Pp. ix+407. Illus. $14.95. The authors furnish descriptions of the algae species of the State of Illinois. Following a brief synopsis of the algal classes, the Illinois Algae are grouped under the phyla Chlorophyta, Chrysophyta, Pyrrophyta, Euglenophyta, Myxophyta and Rhodophyta. This profusely illustrated text is highly recommended to all interested in the Algae.

FLORA NEOTROPICA, MONOGRAPH NO. 6. TREMELLALES, by Bernard Lowy. Published for the Organization for Flora Neotropica, by Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022. 1971. Pp. 153. Illus. Paper covers, $12.95. This is a periodical designed to present in monographic form taxonomic accounts of all plants growing within the Western Hemisphere tropics. Geographic, ecologic, cytologic, ecologic, anatomic, morphologic, chemical and economic data are presented as well as bibliographies, citations of species names and indices, for each group treated. Monograph No. 6. Tremellales, is highly recommended to all who are interested in the flora of the New World tropics.

PHLOEM TRANSPORT IN PLANTS, by Alden S. Crafts and Carl E. Crisp. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1971. Pp. xxii+481. Illus $12.50. The objective of this excellent new text "is to collect and interpret the experimental information available on phloem transport in plants." The subject is developed under the headings —1. structure—function relations; structure of the phloem, translocation path, phloem plugging and phloem exudation; 2. Experimental results: assimilate movement, plant harmone transport, and movement of exogenous substances; 3. Translocation mechanism: proposed mechanisms, effects of environmental factors, some qualitative aspects of translocation, and in retrospect. Very highly recommended to all interested in the physiology of plants.

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4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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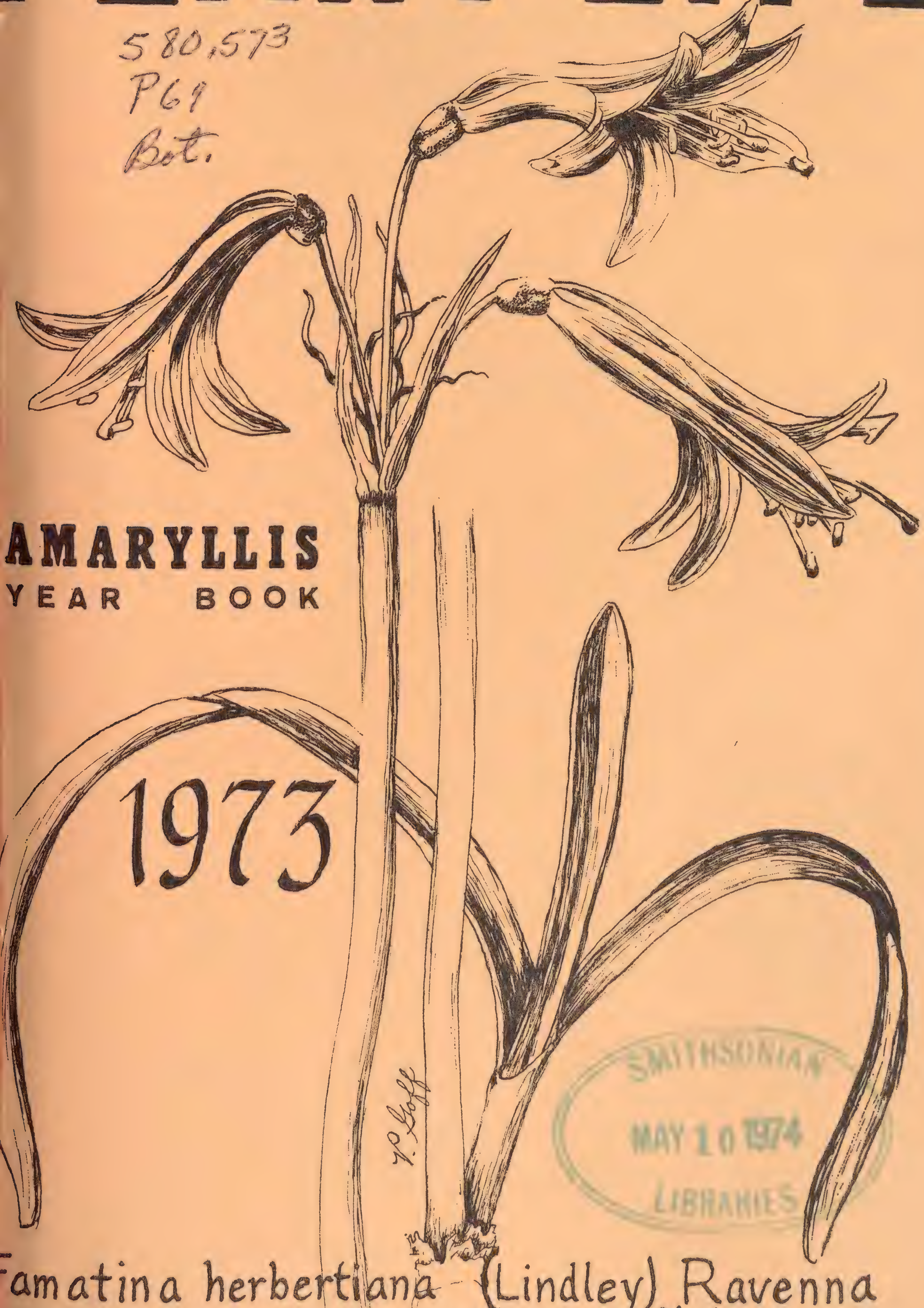

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CORREGENDA

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Page 141, 11th line from bottom, for "*anglise*" read "*anglice*".
Page 142, 12th line from bottom, for "*subg. nov.*" read "*subreg. nov.*"
Page 143, 8th line from top, for "*anglise*" read "*anglice.*"
22nd line from top, for "Paeophyta" read "Phaeophyta."
12th line from bottom, change "asexual" to "sexual."
Between 10th and 11th lines from bottom, add line, "Lineagics, 1964, p. 144."

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Page 20, text, line 5, and in legend (caption), Fig. 6, in line 3, for "National University" read "Agricultural School".
Page 43, text below Abstract, move 9th line, beginning "Verd. from So. Africa, etc." above the preceding line.
Page 129, text, 18th line, for "add" read "and".
Page 131, middle of page, "5. Steinmannia R. A. Phil. 1844", change "1844" to "1884".
Page 135, under 2b., second line, for "paex" read "apex".
Page 136, 7th line, for "Aleution" real "Aleutian".
Page 137, 8th line from bottom, change "folis" to "foliis".

SO. CALIF. AMARYLLIS SHOW—continued from page 26.

California Hemerocallis and Amaryllis Society, for the captions under the figures.—*Hamilton P. Traub*

AMARYLLIS JUDGES' CERTIFICATE

Since the last report in the 1971 Amaryllis Year Book (Page 27), the following numbered Amaryllis Judge's Certificate has been issued:

No. 196, Mrs. Clem C. Smith, Rt. 2, Box 76-MB, New Caney, Texas 77357. Horticulture only.

KEEPING UP WITH LATEST DEVELOPMENTS.—Current progress in the judging of Amaryllis is recorded in the Amaryllis Year Book. In order to insure that those holding Amaryllis Judge's Certificates keep up with these new developments, all certificates issued are valid only when presented with the current membership card of the American Plant Life Society which includes membership in the affiliated American Amaryllis Society. After several years a refresher course is recommended.

PLANT LIFE, VOL. 29, NO. 1, January, 1973

AMARYLLIS
YEAR BOOK
1973

Year Book of
The American Amaryllis Society
40th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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Correspondence about auxiliary membership of regional and local societies in the Society should be addressed to: Dr. Thomas W. Whitaker, Executive Secretary, Box 150, La Jolla, Calif.

Auxiliary LOCAL AMARYLLIS SOCIETIES

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PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the fine cover design featuring *Famatina herbertiana* (Lindl.) Rav.

This is the 40th annual appearance of Herbertia, or the Amaryllis Year Book, including 15 separate annual volumes, from 1934 to 1948, and 25 editions published in combination with PLANT LIFE, from 1949 through 1973.

HERBERTIA, vols. 1—15 (1934—1948), published separately
PLANT LIFE, vols. 1—5 (1945—1949)*
PLANT LIFE, vols. 6-29 (1950—1973)

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* HERBERTIA OR AMARYLLIS YEAR BOOK published in combination with PLANT LIFE beginning in 1949.

The 1973 edition is dedicated to Dr. César Vargas Calderón, Emeritus Professor of Botany at the UNIVERSIDAD SAN ANTONIO ABAD DE CUZCO, in recognition of his outstanding contributions to the knowledge about the Amaryllidaceae.

Dr. Vargas is the founder of HERBARIO VARGAS with specimens numbering 22,000. This includes tuberiferous *Solanum* species, and many other plants, and particularly the Amaryllidaceae of Peru. It contains the holotypes of more than 50 new species discovered and named by Dr. Vargas, including among others, 11 *Bomarea* species, and various species of *Hymenocallis, Urcelina, Stenomesson* and *Amaryllis* For the past 12 years he has carried on an *Amaryllis* project, and the results from this work will be published as a comprehensive treatise on the Genus *Amaryllis* in Peru. In the present issue of the AMARYLLIS YEAR BOOK, Dr. Vargas contributes an interesting autobiography, and an article on his research activities, particularly with the amaryllids.

Other articles on *Amaryllis* appear in the present issue. Mr. Doran reports on a successful search for *Amaryllis traubii* in South America. Mr. Blossfeld writes about *Amaryllis calyptrata* and the breeding for yellow *Amaryllis.* Dr. Cardenas describes two new *Amaryllis* species; and Mr. Korsakoff writes about two new hybrid *Amaryllis.* Dr. Cage considers the value of in- and outbreeding in *Amaryllis* breeding. Dr. Bell reports on the role of triploids in *Amaryllis* breeding, and the culture of *Amaryllis* ovules. Prof. Mertzweiller writes about his *Amaryllis* breeding project and Mr. Clouette describes his experience in growing *Amaryllis* from seeds.

Some years ago, the late Robert Fleming in England crossed *Alstroemeria aurantiaca lutea* and *A. violacea* and this gave rise to the tall vigorous, large-flowering hybrid now named. 'Walter Fleming' in his honor. This single stroke of fortune laid the foundation of the thriving *Alstromeria* cut-flower industry in Europe, showing what the hybridizer can accomplish. Mr. Sahin reports on this *Alstroemeria* cut flower industry in Europe. Those members who are not growing Alstroemerias at present are urged to look into the advantages of growing these charming plants as amateurs or possibly for the cut flower trade. This is a real success story.

Dr. Cardenas describes new *Zephyranthes* and *Haylockia* species; Mrs. Katherine L. Clint writes about an apparently vanishing Mexican *Habranthus* species. Mr. Karsakoff reports on some hybrids in the Tribe Zephyranthes. Mrs. Marcia Clint Wilson contributes a comprehensive report on the species and hybrids under cultivation from the Tribe Zephyrantheae. Mr. Hardman presents the report from the Nerine Committee. Mrs. Menninger writes about her breeding project for white Nerine hybrids, and Mr. Lindsay reports on Nerines in Australia, and on the quest for miniature amaryllids.

Mr. Christianson writes about his extensive collection of cultivated amaryllids in Portugal; Mr. Ellenbecker traces the history of *Paramongaia weberbaueri* under cultivation. Mr. Tisch recites his experiences with amaryllids. Leonora Milstead writes about her experiences with *Lycoris;* Mr. Beckwith D. Smith reports on the growing of amaryllids in north Florida. Mr. Buck presents the 1972 Daylily Report. There is a report on the second decade of *Hemerocallis washingtonia,* the tetraploid species, 1959—1968. There are reports on the 1972 Amaryllis shows, and other articles as shown by the table of contents.

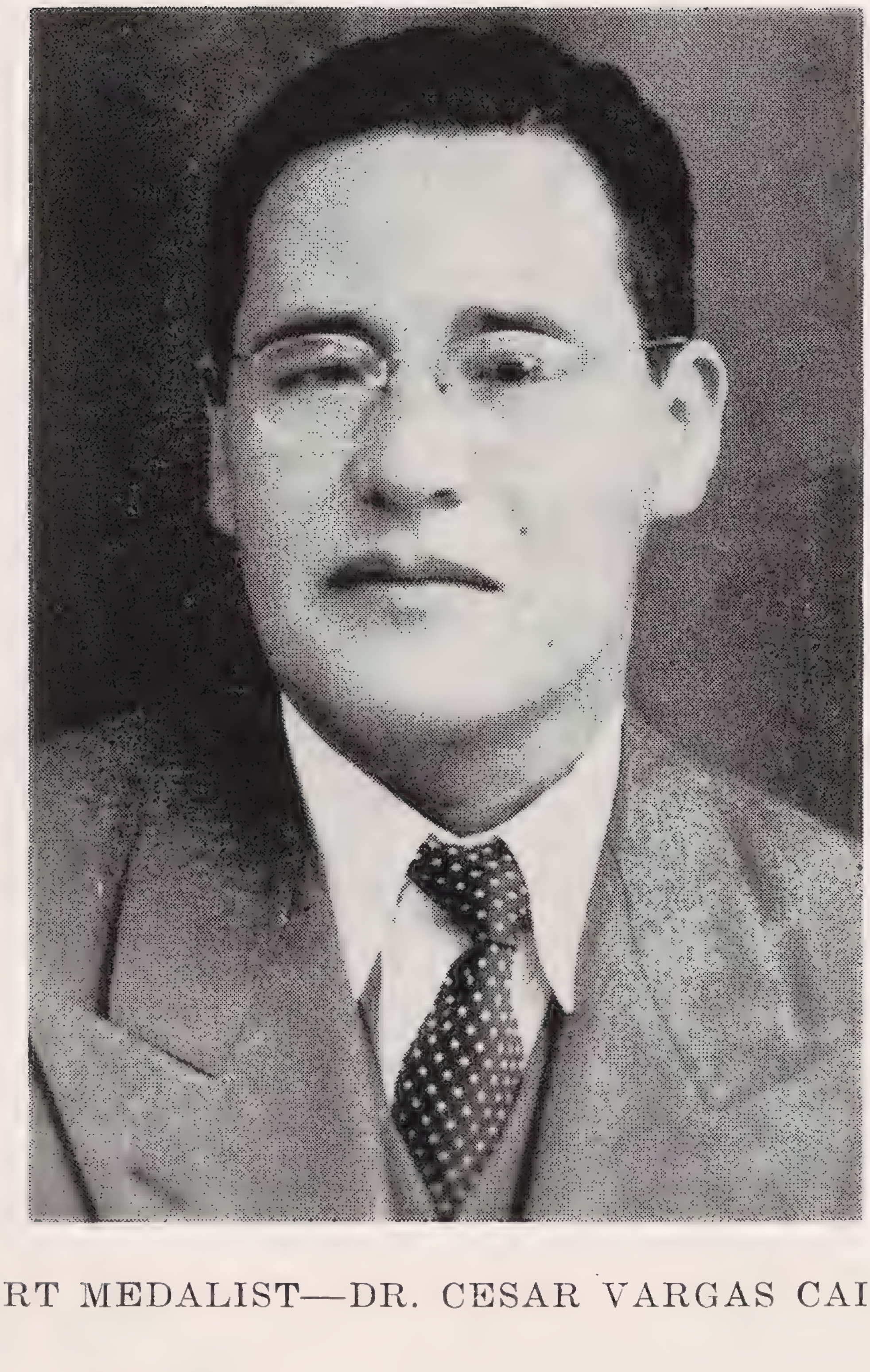
Contributors to the 1974 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1973, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.*

We are grateful to the SOUTHERN CALIFORNIA HEMEROCALLIS AND AMARYLLIS SOCIETY for sponsoring the four color plates of the outstanding Peck tetraploid daylilies (*Hemerocallis washingtonia* Traub) facing page 124.

December 12, 1972,
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

Dedicated to
Dr. Cesar Vargas Calderon



HERBERT MEDALIST—DR. CESAR VARGAS CALDERON

CESAR VARGAS CALDERON

AN AUTOBIOGRAPHY

I was born at Cuzco, Peru, the ancient capital of the Inca Empire, on April 26, 1905, the son of Angel P. Vargas and Conception Calderón. I married Antonia Carrillo, and we have been blessed with four children, Yolanda, Carmen, Hugo, and Martha.

I studied and received my doctorate degree at the Universidad Nacional San Antonio Abad de Cuzco in 1934. In the following year, I was invited by the same University to teach botany, succeeding my former Professor, Dr. Fortunato L. Herrera, who had moved to Lima.

HERBARIO VARGAS (CUZ)*

In 1935, I started to organize an herbarium, with the objective of collecting plant specimens around Cuzco, and also in southern Peru. from the Pacific Coast, the sierras, cordilleras and the forest regions. The collection has now grown to 22,000 specimens. The collections, apart from the cultivated and wild potato specimens, which number more than 3,000, include the Bues Herbarium with 2,000 specimens of cryptigams, mostly ferns, from the Convencion Provincia (Departamento Cuzco); the numerous specimens of tuberiferous *Solanum* species (2,000 specimens), various Amaryllidaceae and other plants. Among these are 200 new species of plants, including the new genus *Vargasiella C. Schweinf.* of the Orchid Family. HERBARIO VARGAS contains the holotypes of more than 50 new species described by me, mostly tuberiferous *Solanum* species, but also species of *Bomarea*, *Urceolina*, *Eustephia*, *Hymenocallis, Stenomesson* and *Amaryllis.* My descriptions, excluding the *Bomarea* species, were made from living plants under cultivation over a period of many years.

RESEARCH WORK

Over the years, I have carried on research within the genera *Hymenocallis* and *Amaryllis,* leading to the growing of hybrid seedlings. During the 15 years in which I conducted research with the cultivated native species of potatoes of southern Peru, I accumulated a living collection of native tuberiferous *Solanum* species numbering about 1,200. The results of my research were published in Papas SUDPERUANAS. In recognition of this work, I was awarded the PREMIO NACIONAL DE LA CULTURA ANTONIO RAMONDI.

I was a member of the following indicated foreign botanical expeditions in Peru:—(a) 1938-1939, the Second Botanical Expedition to the Andes, directed by Dr. T. H. Goodspeed, Professor of Botany and Director of the Botanical Garden, Berkeley: (b) 1959, the Botanical Expedition of the Max-Planck Institute, Koeln, Germany, Dr. Hans

---

* (CUZ) is the international abbreviation for HERBARIO VARGAS. See J. Lanjouw & F. A. Stafleu. Index Herbariorum, Part 1. The Herbaria of the World. 5th ed. Utrecht. 1964.

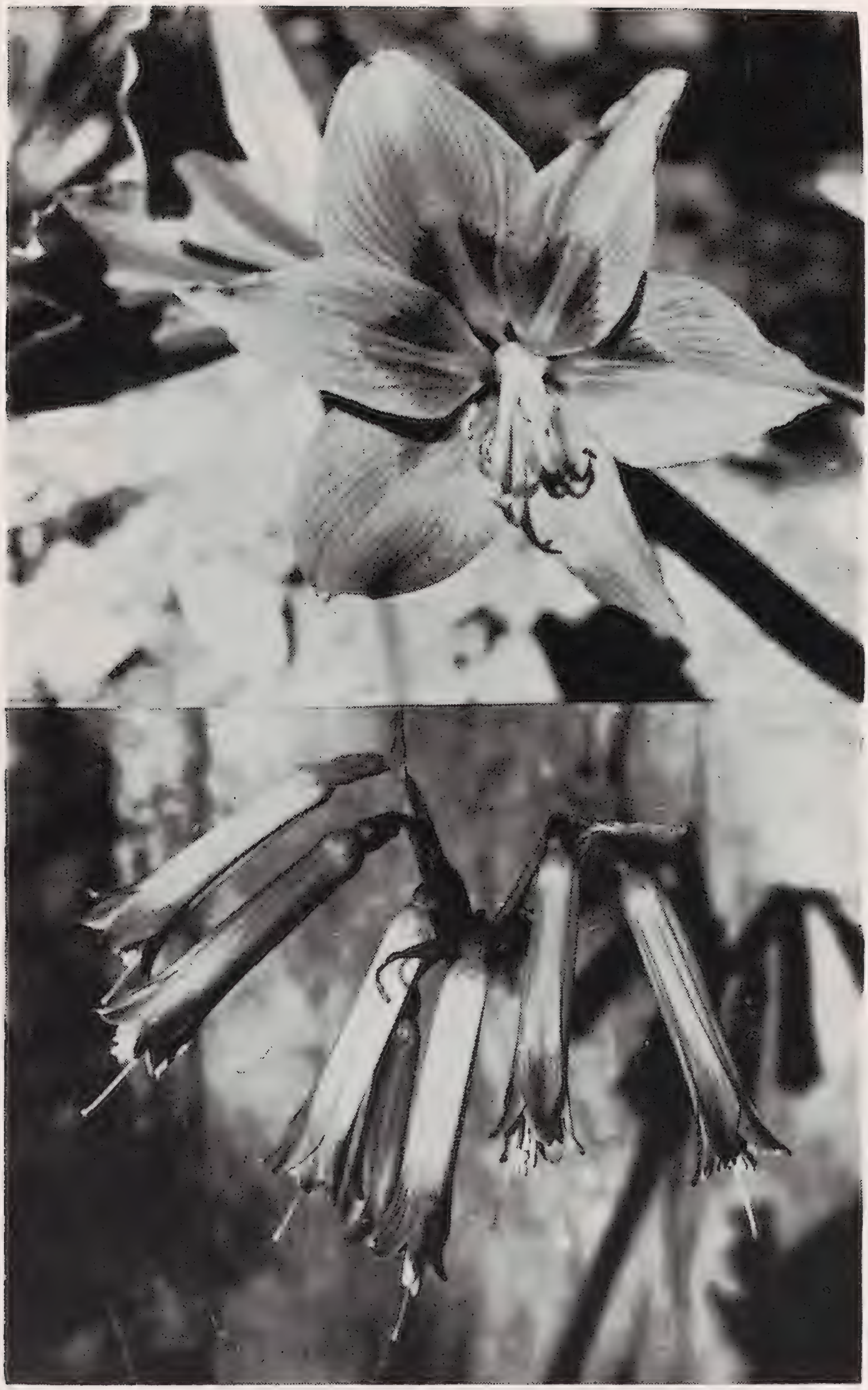


Fig. 2. Upper, **Amaryllis intiflora** Vargas, and Lower, **Eustephia darwinii** Vargas.

Ross, Director; and (c) 1961, the John Hopkins Expedition, Dr. Dodds, Director, England.

I have represented the University of Cuzco at many Botanical Congresses in America and Europe.

My interest in the genus *Amaryllis* was stimulated in the first instance by the request from interested persons in the Republic of Colombia, The United States of America, and England, for bulbs to be collected by me. When I visited certain European countries, I turned special attention to *Amaryllis* in the herbaria at London, Edinburgh, Paris, Madrid and Berlin. Then I began to collect many *Amaryllis* species native to southern Peru. Up to the present, I have more than 20 Amaryllis species under cultivation. I have taken notes and other records on *Amaryllis,* including more than 300 color photographs in order to obtain data on color, form, etc. Dried specimens have been deposited in HERBARIO VARGAS. I hope to be able in a few months to publish the preliminary results from 12 years' research on the genus *Amaryllis* in Peru.

At present I am retired from my teaching duties at the University of Cuzco, as Emeritus; and have been awarded the honor of the GOLD MEDAL, AMAUTA. In July 1972, I was honored with the GOLD MEDAL, GARCILASO DE LA VEGA by the CASA DE LA CULTURA of Cuzco.

Finally, I should like to thank my good friends and colleagues, Dr. Martin Cardenas, Cochabamba, Bolivia, Dr. Hamilton P. Traub and Mr. John Leonard Doran, both of the United States of America, who gave me their valuable advice in many ways. I am also grateful to my many students and assistants who have assisted me in my field trips over many years of collecting various plants including *Amaryllis* bulbs; and to the AMERICAN PLANT LIFE SOCIETY for awarding me the WILLIAM HERBERT MEDAL in 1973.

November 28, 1972,
Herbario Vargas,
Cuzco, Casilla 79, Peru.

AMARYLLIDACEAE I HAVE COLLECTED

CESAR VARGAS CALDERON, *Cuzco, Peru*

As botanical collector for HERBARIO VARGAS, I have accumulated many plants since the 1930's, including many amaryllids other than *Amaryllis* species. At first, my attention was drawn to the genus *Bomarea,* a group which includes a great many very beautiful species in Peru. I discovered about ten new *Bomarea* species. After several years, I had planned to undertake a revision of the genus *Amaryllis* in Peru.

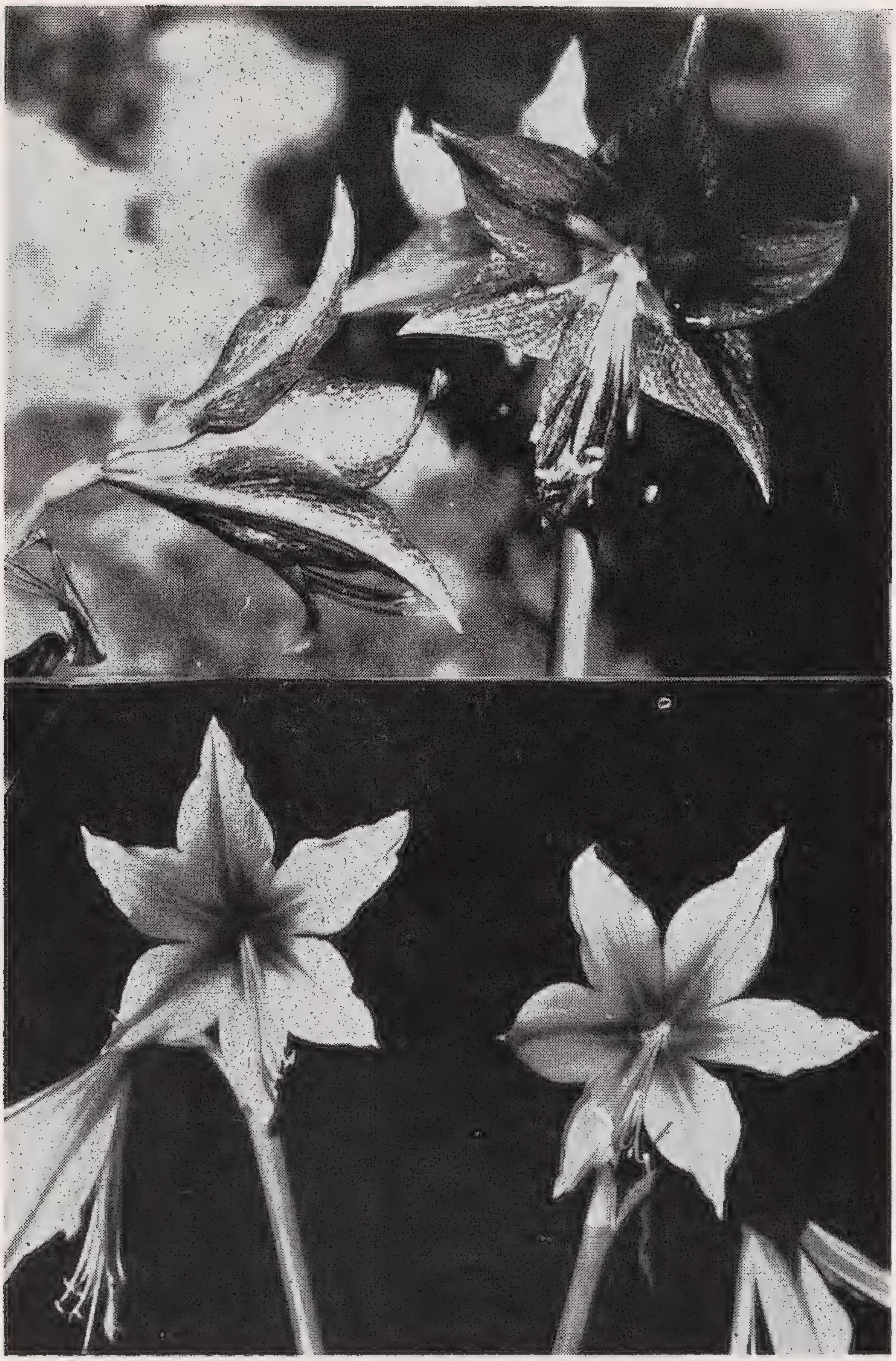


Fig. 3. Upper, **Amaryllis machupijchensis** Vargas, and Lower, **Amaryllis macbridei** Varga.

This required that I pay special attention to the collection of bulbs, taking field notes about these plants, and attempts at the cultivation of *Amaryllis* species at Cuzco.

The following listing includes the various amaryllids, other than *Amaryllis* species, which I have collected and named:

Bomarea ampayesana Vargas
Bomarea biflora Vargas
Bomarea killipiana Vargas
Bomarea cuzcoensis Vargas
Bomarea tacnaensis Vargas
Bomarea velascoana Vargas
Bomarea herrerae Vargas
Bomarea longistyla Vargas
Bomarea calcensis Vargas
Bomarea ferreyrae Vargas
Bomarea cerratea Vargas
Eustephia coccinea Cav.
  var. *multiflora* Vargas
Eustephia darwinii Vargas
Hymenocallis multiflora Vargas
Urceolina weberbaueri Vargas
Urceolina urubambae Vargas
Stenomesson morrisonii Vargas
Stemonesson imasumac Vargas

Stenomesson imasumac Vargas is the most handsome and gorgeous in the genus. Fortunately, at the present time I have many plants of it under cultivation for use in my experiments.

STUDIES IN THE GENUS AMARYLLIS

About 12 years ago, I started collecting trips especially dedicated to the Genus *Amaryllis.* These explorations included the following localities:

Departamento Cuzco, including the forest valleys of Kosnipata, (Paucartambo Provincia); "15 Mil" to Inambari (Quispicanchis Provincia); localities in Convencion Provincia, and also in the Provincias of Uruamba, and Calca.

Departamento of Puno: the valley of Ollachea, (Carabaya Provincia); the localities and valleys of Limbani, Oconeque, San Jose, San Juan del Oro, and Cuyo-Cuyo, in Sandia Provincia.

In Departamento of Puno, I found many interesting *Amaryllis* species and varieties, including for instance, *Amaryllis macbridei* Vargas (see Fig. 3). In addition to the field notes which I have taken down year after year during the flowering season, I made color slides of the flowers. I have also compiled other data which may be useful when the results of the project are written up in the future as a preliminary report of the genus *Amaryllis* in Peru.

I have taken the liberty of including a few illustrations of new *Amaryllis* species which I have discovered and named, *Amaryllis intiflora* Vargas, *A. macbridei* Vargas and *A. machupijchensis* Vargas (Figs. 2 and 3).

BIBLIOGRAPHY OF PAPERS CONCERNING AMARYLLIDS

Vargas, César. Two New Bomareas and a New *Stenomesson.* National Hort. Mag. (Oct. 1943), pages 130—133, plates 1 and 2.

--------. Two New Species of *Bomarea* from Peru. Bull. Gray Herb. Harvard Univ. June 1945.

---------. Especies Nuevas o Críticas de la Flora del Perú. Rev. Universitaria, Cuzco, Perú. Nro. 107. 1954.

---------. De Novis Speciebus Florae Peruvianae. Bol. Facultad de Ciencias, Univ. de Cuzco. Nro. 1. 1960.

---------. Two New *Bomarea* Species from Peru. Plant Life 21: 155—158, plates 38 and 39. 1965.

---------. New *Eustephia* Species. Plant Life 23: 47—48. 1967.

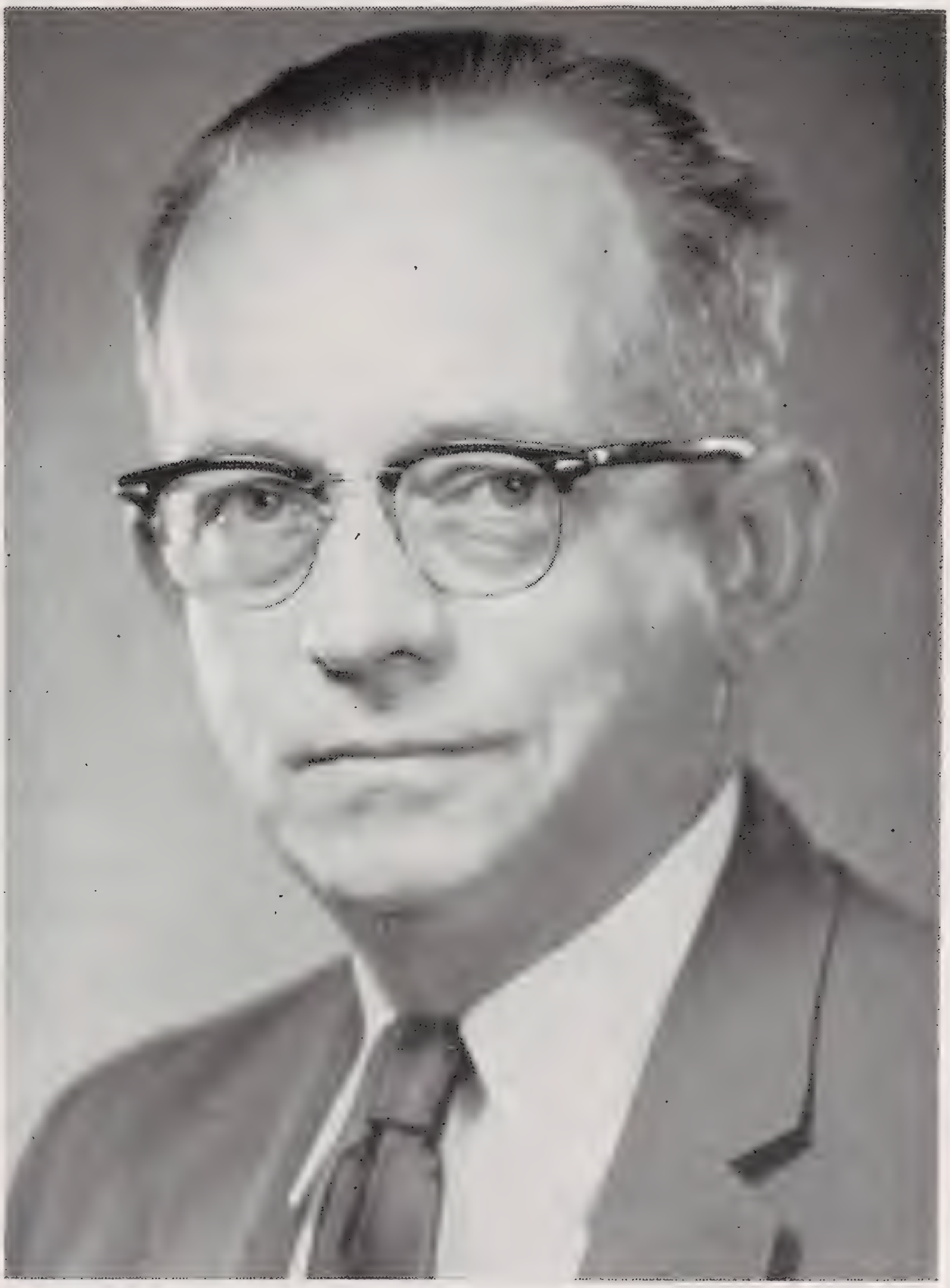


Fig. 4. James Edward Mahan.

---------. Especies Nuevas para la Flora del Sur-Perú. Biota. VII, Nro. 61, Dic. 1969.

---------. Una Nueva especie de *Amaryllis* del Sur-Perú. Biota. VIII. Nro. 65. Dic. 1970, Lima, Peru.

November 28, 1972,
Herbario Vargas,
Cuzco, Casilla 79, Peru.

IN MEMORIAM—JAMES EDWARD MAHAN, 1909-1972

James Edward Mahan (Jim), our Registrar of Amaryllis names, died suddenly on Sunday, September 10, 1972, at the age of 63, of a heart attack. He had been hospitalized for a short period in July and August and was apparently progressing nicely when the fatal attack came.

Jim, as he was so fondly known to his many friends and acquaintances, was born in New Orleans, Louisiana, on August 20, 1909, where he attended Sacred Heart Elementary School and Warren Easton High School, where he earned many honors. Upon graduation he attended Tulane University in New Orleans.

He entered the Army in 1941 and served until 1946. During that time he suggested and helped to install some accounting practices in the Quartermaster Corps which I understand are still in use. After his tour of duty was over, being discharged as a Captain, Jim returned to private business and in 1948 joined the James E. Comiskey Company in New Orleans as Office Manager and Secretary, from which position he retired on April 1, 1972.

From 1967 until his death Jim held the important position of Registrar of Amaryllis Names in the AMERICAN PLANT LIFE SOCIETY, which he administered with his usual efficiency. He helped reform the exhibition schedule for staging Amaryllis shows and also wrote an article on The Staging of Amaryllis Shows (PLANT LIFE 1968), and at the time of his death was attempting to set up standards for classification and divisions of the newly developed Double Amaryllis which were coming into prominence in the New Orleans area.

He was a PATRON LIFE MEMBER of the AMERICAN PLANT LIFE SOCIETY (1969). He was also a member of the MEN'S AMARYLLIS CLUB OF NEW ORLEANS INC., having joined the organization shortly after its inception, and had held various offices in the Club. He served as its Fourth President, was Show Chairman for one of its Shows, and then served as permanent Classification Chairman. He wrote many articles for its News Letter.

Among his other club memberships were the AMARYLLIS SOCIETY OF BATON ROUGE, Louisiana, THE LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH, THE JEFFERSON ORCHID SOCIETY and the LIONS CLUB of Metairie.

Needless to say, he was held in high regard and esteem by all who knew him and his passing will mean a great loss to the MEN'S AMARYLLIS CLUB OF NEW ORLEANS and also to the officers and members of the AMERICAN PLANT LIFE SOCIETY.

To keep up the tradition of Jim's donating a trophy in the annual Men's Amaryllis Club show, his sister Helen has established a trust fund to continue awarding an annual "James E. Mahan Memorial Award."

Jim is survived by his brother Henry and two sisters, Helen T. Mahan and Mrs. Adele Johannesen.—*Walter R. Latapie.*

1972 HERBERT MEDAL PRESENTED TO JOHN LEONARD DORAN

Fay Rosoff, *Secretary, Southern California Hemerocallis and Amaryllis Society, 5617 Natick Ave., Van Nuys, California 91041*

At our regular meeting on January 22, 1972, we were again honored to have one of our members, Mr. John Leonard Doran, presented with the William Herbert Medal by Dr. Thomas W. Whitaker, Executive Secretary of the American Plant Life Society, on behalf of the Amaryllis Section. Mr. John Leonard Doran is Chairman of the Amaryllis Committee and was presented with the Herbert Medal for his extensive work in collecting in the field (Central and South America), various species of plants and seeds of Amaryllis, other Amaryllids, flowering plants, shrubs, and flowering trees, all of which can be grown in Southern California.

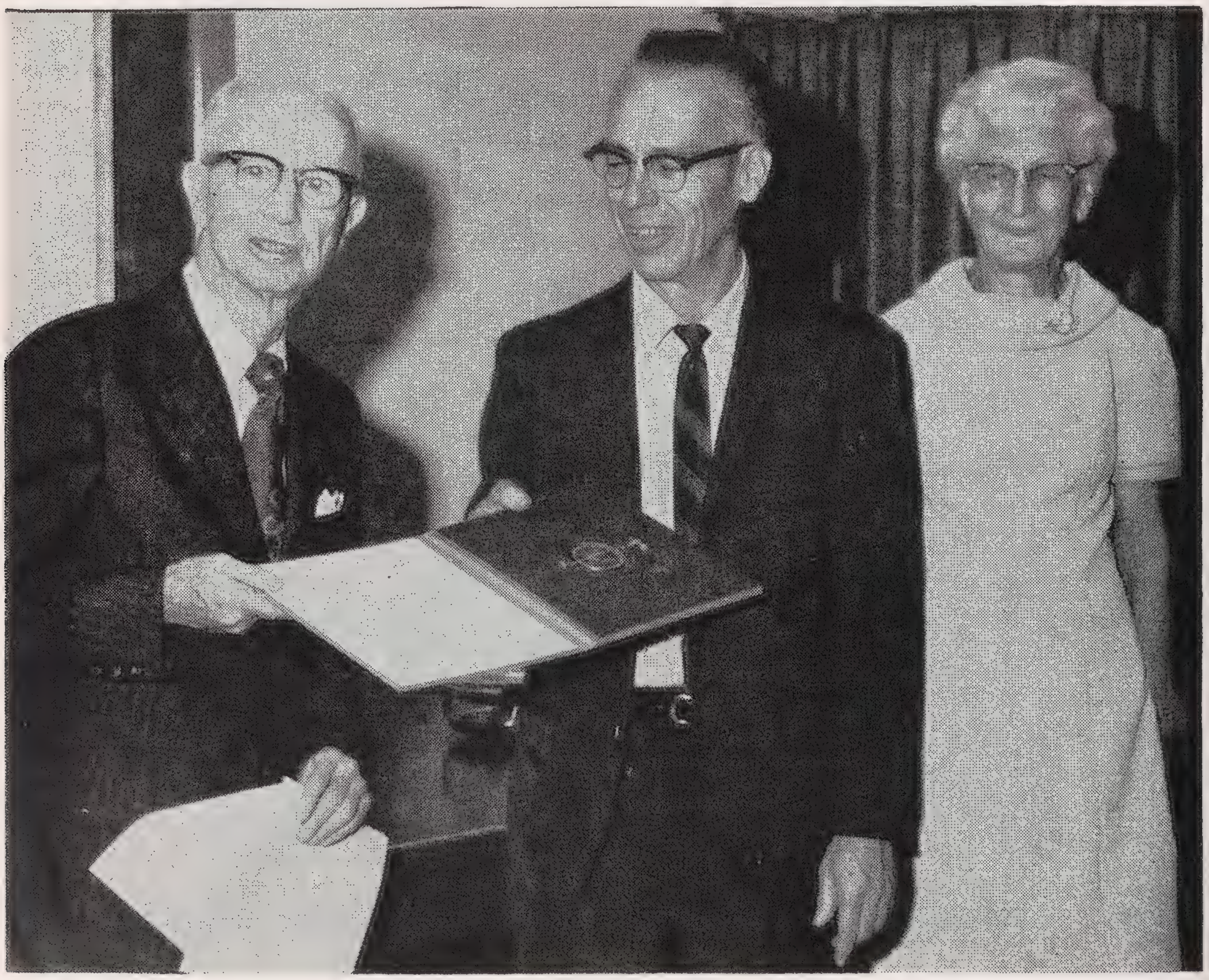


Fig. 5. Dr. Thomas W. Whitaker (left is shown presenting the 1972 Herbert Medal to John Leonard Doran at the January 22, 1972 meeting of the Southern California Hemerocallis and Amaryllis Society held at the Los Angeles State and County Arboretum. Mrs. Corabelle Whiting Doran, his mother, beaming, approves the selection. See the 1972 PLANT LIFE for the autobiography of John Leonard Doran and a brief biography of Mrs. Corabelle Whiting Doran. Photo by I. K. Rosoff.

The official citation from Dr. Hamilton P. Traub was read by Dr. Thomas W. Whitaker. Mr. Doran responded with a few words of thanks to Drs. Traub and Whitaker for their valuable assistance in classifying the species of bulbs he brought back to the United States, and added a few more words about his mother, Mrs. Corabelle Whiting Doran, who has accompanied him on some of his collection trips. He also informed the members that at the March 18th meeting, he would give a lecture on potting mixtures, etc., percentage of water the various potting ingredients will hold, together with parts per million of fertilizer recommended; and then present the educational ''travelogue'' of his 1971 trip to Bolivia and Peru.

Among those present to honor Mr. Doran were Mr. W. Quinn Buck, 1969 HERBERT MEDAL recipient; Dr. John Cage, and Mrs. Flores Foster, Amaryllis Committee members; Mrs. Bert Williams, Official Amaryllis Judging Instructor; Mrs. K. B. Anderson, Amaryllis Round Robin Group Leader; Mrs. Emma D. Menninger, Emeritus Registrar of Plant Names (Nerines); and Mr. Charles Hardman, Associate Registrar of Plant Names (Nerines).

As a tribute to Mrs. Corabelle Whiting Doran, and the general interest in Nerines, Mr. Charles Hardman gave a 20 minute illustrated lecture on Nerines.

EDITOR'S MAIL BAG

Under date of July 21, 1972, we are informed that Mr. & Mrs. Vincent R. Fesmire will move on July 27, 1972 to 252 Tierney St., Perris, Calif. 92370. Thereafter they will spend the six winter months of each year at the above address, and the six summer months at Ocean City, New Jersey. Mr. Fesmire promises to contribute an article on winter amaryllids in due course.

The last letter received from Dr. J. C. Th. Uphof, 2903 San Nicholas Street, Tampa, Florida 33609, was dated June 10, 1968, and was answered on June 30, 1968. Letters sent to this address since that date have been returned marked ''left no address.'' Anyone having knowledge of the present residence of Dr. Uphof (a HERBERT MEDALIST; see PLANT LIFE Vol. 8. 1952) are requested to report to the editor.

Since the above was written, we have received word that Dr. Uphof died in October or November 1969. The exact date has not been obtained.

Mr. Zilmir K. T. Sahin, 't Huys met de Beyen, Uiterweg 34, Aalsmeer 1210, Netherlands, writes under date of October 16 that he is looking for a source of the White Vallota, *Cyrtanthus speciosa* (L. f) Traub, syn—*Vallota purpurea* Ait. It is hoped that those who have this information will report it either to him directly or in PLANT LIFE.

Mr. G. A. Zuidgeest, Middlebroekweg 71, Honselerdijk, Netherland, writes under date of October 12 that he would be pleased to have the address of Mr. Peterson, ''who has a nursery for carnation cuttings.''

Will anyone with this information please send it on to him or report it in the next issue of PLANT LIFE. He is also interested in having the name and address of a grower of Bouvardias.

Mr. Burr Cluette, 701 7th Ave., San Diego, Calif. 92101, writes under date of Oct. 19, 1972, that he will visit his niece in Buenos Aires, Argentina, over Christmas leaving December 15 and returning 31, 1973. The Editor has asked him to publish a brief report on his trip in PLANT LIFE.

Mr. J. J. Barbour, Department of Biology, Grower and Superintendent, University Greenhouses, University of Akron, Akron, Ohio 44304, is in search of seeds and bulbs of *Amaryllis* species. He is particularly interested in obtaining *Amaryllis aglaiae, A. calyptrata, A. evanisae, A. papilio, A. pardina, A. parodii,* and also *Worsleya rayneri.* It is hoped that members will assist Mr. Barbour in obtaining these species.

Mrs. Meta M. Korsakoff, wife of Alek Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208, writes under date of Nov. 22, 1972, that Alek is very sick, having had 10 cobalt treatments on his spine. The tumor on his spine has paralyzed him from the waist down. He knows that his is a terminal case. However, he is a very brave and courageous man, indicating that ''Our Father in Heaven knows best.'' His mind is as sharp and alert as ever. He is eager to hear from his many friends who should write to the address given above.

During 1972, we had the great pleasure of a visit from Dr. A. Graham Sparkes, of Churchfield, Station Road, East Preston, England, who is an enthusiastic plant collector and gardener. He recently collected many plants in Chile, including a large assortment of *Alstroemeria* species, and related *Bomarea* and *Leontochir* species.

The sad news has reached us that Wilfred McDonald James, 17950 Los Olivos Drive, Saratoga, California 95070 died on Dec. 27, 1972. Mr. James received the William Herbert Medal for 1941 in recognition of his outstanding contributions toward the advancement of knowledge about the Amaryllidaceae. Members are referred to **HERBERTIA** Vol. 8. 1941, pp. 33—35, Plate 203 (portrait), for his autobiography.

1. REGIONAL ACTIVITY AND EXHIBITIONS

INTRODUCTION

Most of the local and regional Amaryllis shows were held again in 1972. However, Mr. W. A. McCollum, Mobile, Alabama, writes that the Greater Gulf Amaryllis Show was not staged in 1972 due to unusual spring weather which was unfavorable for Amaryllis blooms at the proper time. Plans are being made for the 1973 Show.

No reports were received from those in charge of the usual Greater Houston Amaryllis Club Show, and the Garden Circle Amaryllis Club (New Orleans) Show. These clubs apparently will stage shows for the 1973 season.

The members of the Mattiesburg (Miss.) Amaryllis Society, who are keenly interested in these plants, plan to exhibit Amaryllis in the homes of members of the Society. The 1973 showings were based on the arrangement as given in the Traub—AMARYLLIS MANUAL. Accurate records will be kept of the hybridizing efforts.

1972 OFFICIAL AMARYLLIS SHOWS

The show season began with the 1972 Official Corpus Christi (Texas) Amaryllis Show, and the 1972 Greater New Orleans Official Show All-Horticulture Amaryllis Show, both held on the same dates, April 8 and 9. These were followed on April 15 and 16 by the 1972 Official Houston Amaryllis Society Show.

The 1972 Baton Rouge (Louisiana) Official Amaryllis Show was held on April 23, and the show season closed with the 1972 Southern California Official Amaryllis Show on April 29 and 30.

NOTE TO AMARYLLIS SHOW ORGANIZERS

It is important to designate some one to write a *brief* review of the official show, and to send this promptly to Dr. Hamilton P. Traub, Editor, Amaryllis Year Book, 2678 Prestwick Court, La Jolla, Calif. 92037. *Your plans are not complete until this appointment has been made.* Only in this way is a permanent international record of your show assured.

1972 OFFICIAL CORPUS CHRISTI AMARYLLIS SHOW

MRS. CARL C. HENNY, *Corresponding Secretary, P. O. Box 3054,*
Corpus Christi, Texas 78404

Once again it is time to report that our Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the "Festival of Flowers", held by the Corpus Christi Council of Garden Clubs on April 8th and 9th, 1972, in the City Coliseum building. We were very fortunate in having 63 entries exhibited by members and non-members in our exhibit, since our winter months were very mild this year, causing many bulbs to bloom ahead of time.

Since we no longer have a Ludwig Challenge Trophy to be awarded to our club members, we are now awarding a large Silver Revere Bowl to the club member receiving the most ''blue ribbons'' in the Ludwig Registered and Named Amaryllis Section. Mr. W. M. Neyland, a veteran grower of amaryllis, received blue ribbons for his entries of Apple Blossom, Ludwig Ace, and Peppermint, which made him eligible for the silver bowl award. He also received blue ribbons on unnamed varieties in the show.

Other entries in the Registered and named Ludwig varieties were 'Loves Desire', 'Fantastica', 'Picotee Petticoat', and 'Red Man' gracilis type.

The ''Special Trophy'' to a non-member was awarded to Mrs. Harvey Fry for her entry of 'Picotee Petticoat', which scored 95 points. The ''Special Trophy'' given to a club member in the ''Breeder's Class'' was awarded to Mr. Walter Hennig and also to Mrs. Levi Materne, for their entries in that class.

The ''Award of Merit'' given by the American Amaryllis Society, was given to Mr. W. M. Neyland for his entry of 'Apple Blossom,' which scored 96 points, and also to Mrs. Harvey Fry for her entry of 'Picotee Petticoat', which scored 95 points.

Thirty seven blue ribbons, 8 red ribbons, and 10 yellow ribbons were awarded by judges for entries in the exhibit. Judges for our exhibit were Mrs. E. T. Story, Mrs. R. H. Parkinson, and Mrs. D. A. Ingalls, National Accredited Amaryllis Judges from San Antonio, Texas.

1972 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

DR. TIM CALAMARI, JR., *1016 Rosa Ave., Metairie, La. 70005*

The Men's Amaryllis Club of New Orleans sponsored their thirteenth annual all-horticulture Amaryllis show over the weekend of April 8 and 9, 1972 at the Lakeside Shopping Center Mall in Metairie, La. As always the members of the Club devoted their time, ideas, and energies toward the display of one of nature's most beautiful and stately flowers—the Amaryllis. Some outstanding aspects of this year's Show were the superb publicity spearheaded by Mr. Al Diermayer, and the superior overall planning and coordination of the Show by its General Chairman, Dr. W. N. Palmer, Jr.

The flowers were good and competition was tough. There were 312 entries by club members and 41 by non-members. It really took excellent flowers to find their way to the trophy table. There were more top prizes awarded this year than ever before. Ed Beckham, Dr. Tim Calamari, Jr., L. W. Mazzeno, and J. T. Schmidt divided top honors in the Show.

Mr. Beckham won the ''Best in Show'' rosette, the ''Ludwig Challenge Cup'' and the ''Walter Latapie Trophy'' for an outstanding specimen of ''Picotee Red Lining.''

Dr. Calamari won the ''President's Cup'' for the most blue ribbons won by a member of Men's Club, the ''Amaryllis Inc., Trophy'' for the best species shown, an *Amaryllis evansiae,* and the Sweepstakes Ribbon for the most blue ribbons in the registered and named sections.

Mr. Mazzeno won the ''T.A.C. Construction Co. Trophy'' for the best unregistered and unnamed specimen in the Show, the ''James Mahan Trophy'' for the runner-up specimen in the registered section of the Show, the ''L. W. Mazzeno Trophy'' for the best registered miniature, and the Sweepstakes Ribbon for the most blue ribbons in the unregistered and unnamed sections.

Mr. Schmidt received the ''Robert Diermayer Memorial Trophy'' for the best breeder's seedling exhibited, the ''Lloyd Donahoe Trophy'' for the best two-floret specimen in the Show, and the ''Reuter Seed Co. Inc. Trophy'' for the best cut specimen shown.

Mr. Latapie won a ''Special Trophy'' for the best registered single floret, a 'Nostalgia'.

Mr. Robert won the ''Amaryllis Society of Baton Rouge Trophy'' for the best unnamed and unregistered single floret.

Finally, Mr. Diermayer won the ''Edward F. Authement Memorial Trophy'' for the runner-up specimen in the unregistered and unnamed section; and Mr. Crochet won the ''Southern Seed and Popcorn Co. Trophy'' for the runner-up specimen in the Breeder's Section.

With the memory of our 1972 Show fresh in their minds, all of our members have set their sights for next year's show so that we will have even a larger and prettier show than this year's with that exquisite flower—the Amaryllis.

THE AMARYLLIS SOCIETY OF ALABAMA SHOW, 1972

DEWEY E. HARDY, *President, Rt. 9, Box 55, Eight Mile, Alabama 36613*

The Amaryllis Society of Alabama, Inc. held it's fifth annual spring show at the Chickasaw Civic Center on Grant Street in Chickasaw, Alabama on April 15th and 16th, 1972. The theme of the show was ''The Wonderful World of Amaryllis''. There was much interest shown in both the horticulture and artistic arrangements divisions. Mr. C. E. Tagert of Mobile was the show chairman this year.

Mrs. Claudine Pierce of Mt. Vernon, Alabama won the AMERICAN NATIONAL BANK Trophy for the best named Dutch Potted specimen in the show. In addition, Mrs. Pierce won the following trophies: CLAUDE H. MOORE MEMORIAL TROPHY—Awarded for the most outstanding horticultural specimen of potted Dutch Amaryllis in the show, Division III. Silver tray. THE WILMER SMITH TROPHY—Awarded for the most outstanding potted bulb specimen in the show. Silver pitcher. MARTHA BURDETTE MEMORIAL TROPHY—Awarded for the most blue ribbons in Divisions V and VI. Silver tray.

Mr. Dewey Hardy of Eight Mile, Alabama received the CECIL

BATES TROPHY for the Educational Display.

Mrs. Velma Thompson of Mt. Vernon, Alabama won the following trophies: CHAVIS FURNITURE COMPANY TROPHY—Awarded to the winner of the most blue ribbons in horticulture, Divisions I-VIII. Large silver tray with handles. MR. & MRS. H. P. WHEAT MEMORIAL TROPHY—Awarded to the winner of the most blue ribbons in the potted and cut seedling divisions, Divisions VII and VIII. Large silver tray with handles. EMILE SCHEUERMANN, SR. MEMORIAL TROPHY—Awarded to the winner of the most blue ribbons in combined horticulture and artistic arrangement divisions. Silver champagne cooler. FIRST NATIONAL BANK OF MOBILE TROPHY—Awarded to the best specimen in Division VII. Silver Paul Revere Bowl. MERCHANTS NATIONAL BANK OF MOBILE TROPHY—Awarded for the most blue ribbons in horticulture Divisions I through VII. Silver tray. THE T. J. SWETMAN TROPHY—Awarded for the most blue ribbons in Division III. Large ceramic tray. CLAUDINE PIERCE TROPHY—For the most outstanding collection of three (3) scapes in Division X. Ceramic pitcher.

Mr. C. E. Tagert of Mobile won the following trophies PRESIDENT'S AWARD—Awarded for the most outstanding Dutch seedling hybridized and brought into bloom by exhibitor and being shown for first time Division VIII. Large silver tray with handles. THE AMARYLLIS SOCIETY OF ALA., INC. TROPHY—Awarded to the winner of the most blue ribbons in the cut Dutch division, Division IV. Silver tray THE VINCENT KILBORN SR. MEMORIAL TROPHY—Awarded for the most blue ribbons in Division IV. Silver bowl. The C. E. TAGERT, SR. TROPHY—Awarded for the most blue ribbons in the single bloom un-named division. Small silver bowl. THE C. E. TAGERT, SR. TROPHY—Awarded for the most blue ribbons in the single bloom named division. Small silver bowl.

Mrs. Mae Brown of Mobile, Alabama won the following trophies: DEPOSIT NATIONAL BANK TROPHY—Awarded for the most blue ribbons in the American potted Amaryllis, Division I. Silver tray. THE BROWN TROPHY—Awarded for the most outstanding potted bulb specimen of named American Amaryllis. Silver trophy.

Mrs. Mae Allen of Chickasaw, Alabama won the following trophies: AMARYLLIS SOCIETY OF ALABAMA, INC. TROPHY—Awarded for the most outstanding potted miniature Dutch amaryllis. Silver dish. ALABAMA FURNITURE COMPANY TROPHY—Awarded for the most blue ribbons in the potted miniature named Dutch division. Silver dish.

Mrs. Irene Massingill of Chickasaw, Alabama won the following trophies: SULLY'S DRIVE-IN TROPHY—Awarded to the winner of the most blue ribbons in the artistic arrangement division. Silver bread tray. WEST DEPARTMENT STORE AWARD—Awarded for the most blue ribbons in artistic arrangements. Division XII. Canister set.

Mrs. Ora Wilson of Chickasaw, Alabama won the following trophies: MT. VERNON TROPHY—Awarded for the most outstanding artistic arrangement in show. Relish dish. ELLEN "JACK" CROPP TROPHY—Awarded for the most artistic design of amaryllis with elements other than fresh plant material predominating. Silver award.

Mrs. Earl Conway of Grand Bay, Alabama won the MITTIE YOUNG TROPHY for the corsage.

In the non-member class, Mrs. Lois Koontz of Mobile, Alabama, won the AMARYLLIS SOCIETY OF ALABAMA, INC TROPHY for the most outstanding potted amaryllis, and also the AMARYLLIS SOCIETY OF ALABAMA, INC. TROPHY for the most outstanding cut amaryllis.

The horticulture judges, all from Hattiesburg, Mississippi, were: Mrs. Charlie Bell, Mrs. E. R. Trussell, Mrs. C. W. Woods and Mrs. A. M. Wilson.

Artistic arrangement judges, all from Pensacola, Florida, were: Mrs. J. T. Barfield, Mrs. E. O. Sanders and Mrs. T. C. Barfield.

After the judging of the show, the judges were guests of the Amaryllis Society of Alabama, Inc. at a luncheon at a Mobile restaurant.

1972 OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW

Mrs. A. C. Pickard, *Show Chairman, 1702 North Blvd.,*
Houston, Texas 77006

The 1972 Houston Amaryllis Society Educational Show, held at the Garden Center, Houston, Texas April 16th, goes down in history as the most popular Show staged in the sixteen years.

Abnormalties in the scape and florets due to the freakish spring weather canceled the judging. Since exhibits most worthy of judging would be pot grown, the Society felt this would not be a good representation. Amateur and serious Amaryllis breeders have long been interested in the opportunity of staging a complete Educational Show to encourage cultural experiments and the study of genetic factors such as color, form and time of bloom. Thus, a very successful Educational Show was staged.

The Houston Amaryllis Society has enjoyed a rather long span of productive years. The ingredients which went into the foundation of this Society account for much of its longevity and its accomplishments. Yearly Awards offered by the Society have done a great deal to stimulate the development of growing better plants and the list of those purchasing and growing named registered bulbs is increasing year by year.

Honors go to the Artistic section which has been a great boon to the use of Amaryllis blooms. We always have well known professional leadership in the Arrangement Division and all arrangements must contain some Amaryllis blooms. Many people come to the show just for this division.

An abundance of Amaryllids such as the *Clivia, Sprekelia* and *Hemerocallis* added interest and beauty to the show. Since hybridizing cannot be separated from *Amaryllis* growing, the show combined the one display covering the subject in general from the correct method of potting the bulb through different stages of growth to a mature blooming plant.

The results of cross pollination from seed pod, seeds, planting of seeds, and pots of 1st, 2nd, and 3rd year seedlings were shown. This table consisted of parent plants and the result.

A separate table with instructions on different methods of vegetative and asexual propagation were exhibited showing examples of the methods with pots of growing plants. Each exhibit showed clear identification of the subject and was the eye-catcher for young and old. Tables with samples of soil, fertilizers, mulch, bottles of insects and insect repellants created much interest.

Hostesses served in shifts in each division of the show. They gave demonstrations of hybridizing, answering questions and leading conversations to accomplish the real purpose—educating the people about *Amaryllis.*

The tables of Dutch seedlings continued to be a popular feature of the show. Two tables of named and registered cut specimens were well received by the public and assisted them in making their favorite selections of color. No one can come away from a show staged as this one without renewed enthusiasm for one of life's rewarding and enduring jobs—to help nature in the creation of beauty.

This first all educational show was viewed by hundreds of interested Amaryllis spectators. With more of these wonderful shows, I am sure that additional A. A. S. memberships will be forthcoming.

1972 BATON ROUGE AMARYLLIS SHOW

Joseph K. Mertzweiller
9266 N. Parkview Dr., Baton Rouge, La. 70815

Sunday, April 23 was the date of the 1972 Amaryllis Show sponsored by the Baton Rouge Amaryllis Society. The Nelson Memorial Center on the campus of Louisiana State University provided an ideal setting for the show. Mr. Ken Campbell served as Show Chairman and he was assisted by practically the entire membership in staging what we considered to be the best show in the brief history of our organization. More than 75 exhibits covering all of the principal Amaryllis Show classes, as well as some of the rare classes, were provided through the efforts of some 15 exhibitors. A very interesting educational exhibit on a new cuttage technique for rapid multiplication of amaryllis bulbs was staged by Dr. Ed O'Rourke and his graduate students from L.S.U. Eight prizes in silver provided the principal show awards. The estimated attendance at the show was over 300 persons during the single afternoon it was open to the public.

The Ludwig Challenge Cup was awarded to Mr. Jake Schmidt for a beautiful specimen of 'Bridesmaid'. Mr. Ed Beckham was a quadruple winner. He won the Best Registered Flower award with 'Picotee Red Lining'. Ed also won the much sought after Hybridizer's Award for a picotee seedling No. 72-2, the best Unregistered Single Floret (white seedling No. 104), as well as the Potted Plant Sweepstakes. Mr. L. W. Mazzeno won the award for the Best Small Flower for 'Carina'. Mr. Ken Campbell won the award for the Best Intermediate Flower for his pink seedling No. 72-4. Dr. T. A. Calamari Jr. won the Fred J. Buchmann award which we give for "the most distinctive and unusal potted flower consisting of an amaryllis species or a species hybrid". Dr. Calamari's winning plant was a truly distinctive orchid flowering type derived from *A. evansiae* X *A. cybister*. The award for the Best Unregistered Single Floret went to Mr. Vincent Peuler for 'Nivalis' while the Cut Scape Sweepstakes was awarded to Dr. William Palmer. Several Preliminary Commendation Awards and Awards of Merit were also given.

Again we would like to express our sincere thanks to the Men's Amaryllis Club of New Orleans, to Louisiana State University and to Dr. Ed O'Rourke for helping to make our 1972 show the success it was.

1972 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

HENRY W. MYERS, *Show Chairman,*
4709 W. 132nd St., Hawthorne, California 90250

The eighth annual Amaryllis Show of the Southern California Hemerocallis and Amaryllis Show was held on April 29 and 30, 1972, at the Los Angeles State and County Arboretum, 301 N. Baldwin Av., Arcadia, Calif. The Show was quite satisfactory even though we had an unseasonable and unreasonable spring. There were 14 exhibitors with 74 entries.

The Cecil Houdyshel Memorial Trophy for the Sweepstakes was won by Sterling Harshbarger. The Sweepstakes Runner Up was Leonard Doran who received a trophy from our Society.

The Ludwig Challenge Cup for the best registered Ludwig clone could not be awarded since no entry received 95 points or more. Dr. John Cage's 'El Toro', a beautiful orange-red was judged the best flower in the Show.

In the Hybridizer's Class where entries must be raised from seed by the exhibitor, the following awards were made: Best overall seedling was won by Sterling Harshbarger with a Leopoldii type rose-colored flower; the best Gracilis indoor grown was won by Mrs. S. Harshbarger; best small Leopoldii, 4½ to 6 inch diameter indoor grown was won by Mrs. S. Harshbarger; best Belladonna type hybrid, outdoor grown, was won by Kelly Spearman.

Additional ribbon awards were made to Kelly Spearman, Polly Anderson, D. Cothran, Ed Pencall and Henry Myers. Sylvia Beck received an award for excellence in flower arrangements.

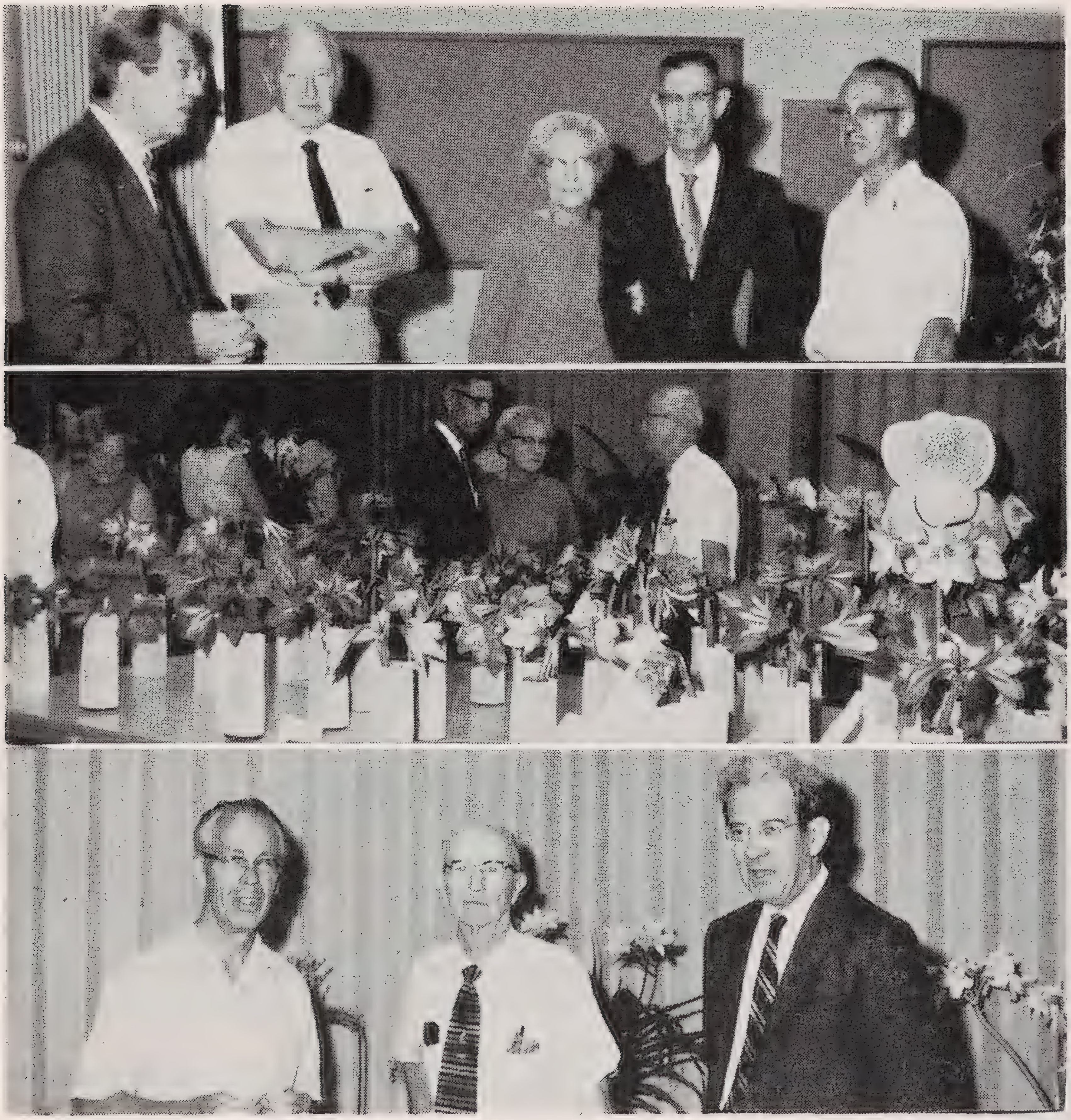


Fig. 6. Southern California Amaryllis Show, 1972, **top:** from left, Mr. W. Quinn Buck, Herbert Medalist, Hemerocallis and Amaryllis hybridizer; Dr. John Cage, Amaryllis hybridizer; Mr. and Mrs. E. A. Angell, Amaryllis hybridizer and commercial grower; and Mr. Leonard Doran, Herbert Medalist and plant collector of South American species. Mr. Doran has probably the largest and finest collection of Amaryllis species.

Mr. E. A. Angell announced that 1972 would be his last year as a grower, and donated his entire crop of Amaryllis seeds (approximately three pounds) to the Amaryllis Society (see Fig. 7).

Middle, Mr. and Mrs. E. A. Angell and Dr. Thomas W. Whitaker discuss Mr. Angell's Amaryllis exhibit.

Bottom, Mr. John Leonard Doran, Dr. Thomas W. Whitaker and Mr. W. Quinn Buck looking over the 1972 Show, obviously pleased with what they see. Photos by I. K. Rosoff.

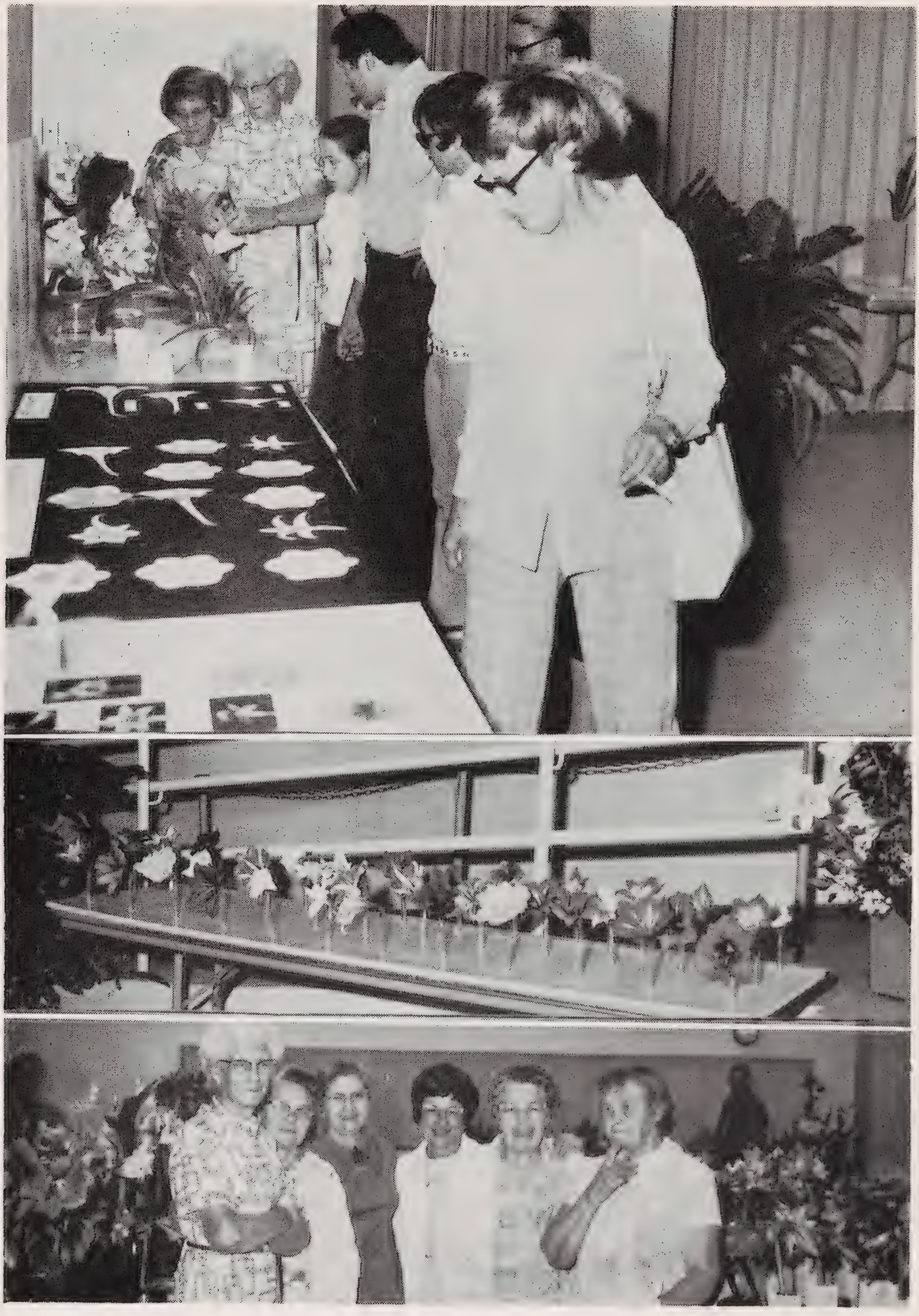


Fig. 7. Southern California Amaryllis Show, 1972, **top:** At one corner of the exhibit hall Mr. Leonard Doran assembled a striking display of various forms and colors of Amaryllids. Sort of looking into the future.

he guesses what the hybridizers will change in size, color and/or shape of the present Amaryllis hybrids. In the background Mrs. Cora Doran is offering, to all show visitors, envelopes containing a teaspoonful of the seeds which M. E. A. Angell donated to the Amaryllis Society.

Middle, Complimentary to Mr. Doran's educational display was the table display arranged by two high school students, Keith and Kenneth Weinstock. Their flowers were entirely home grown and no two alike. A total of 36 different Amaryllis clones.

Bottom, All shows must come to an end, and the clean-up chores are no small task. Photos by I. K. Rosoff.

When visitors entered the show, they were asked to deposit their votes for the Amaryllis flower they liked best. In two days 11,163 visitors entered the Aboretum, 3,739 visited our show, and 758 cast a vote for the best flower—it was grown by Sterling Harshbarger of Pasadena.

Mr. E. A. Angell of Loma Linda and Mr. Bruce Claflin of Upland exhibited hundreds of field grown cut Amaryllis blooms which added much color to the exhibits. A Special Award was made to Leonard Doran for the beautiful display of Amaryllis species in bloom.

The Educational Exhibit set up by Leonard Doran showed the various types of hybrid Amaryllis flowers, where the species came from, and how to grow Amaryllis from seeds. While working at this exhibit, Henry Myers was called the Johnny Appleseed of Amaryllis because of his unceasing demonstrations on growing Amaryllis from seeds; thousands of seeds were given to the many visitors.

ADDENDUM BY I. K. AND FAY ROSOFF, 5617 Natick, Van Nuys, Calif. 91401.—Pictures taken at the Flower Exhibits are of plants and flowers, and rightly so. The 1972 Show attracted a number of visitors who are also contributors to PLANT LIFE, and it is proper that a few pictures of these outstanding hybridizers and growers of Amaryllis would be of interest to the readers. See Figures 6 and 7.

Thankfully, in every organization there are the usual devoted workers, a mere handful, who remove the flowers, empty the vases, pack and store all equipment, clean tables, etc. And who does most of the work? Why, of course, the girls. And here they are from left: Mrs. Cora Doran, Mrs. Sterling Harshbarger, whose husband Sterling H. Harshbarger, gathers most of the trophies and prizes; Mrs. C. D. Cothran, whose husband Mr. C. D. Cothran is a consulting horticulturist to various African and South American countries, and also a hybridizer of Amaryllis and Camellias; Mrs. Phil Rosoff, secretary; Mrs. Eva Turnquist, home economist and a judge at various county fairs; and Mrs. C. H. Welborn, former secretary and a cultivator of a quarter acre of flowers. See bottom Fig. 7.

EDITORIAL NOTE.—We are indebted to Mr. I. K. Rosoff for the pictures of the flower exhibits and some of the outstanding hybridizers and growers of Amaryllis; and to Fay Rosoff, Secretary, of the Southern

SO. CALIF. AMARYLLIS SHOW—continued on page vi.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS,
GROUPING INTO LINEAGES]

IN SEARCH OF **AMARYLLIS TRAUBII**

J. L. DORAN, *1117 North Beachwood Drive, Burbank, California 91502*

Upon returning from Bolivia in 1967, we thought it would be worthwhile to try to recollect *Amaryllis traubii* because its characteristics seemed useful for the hybridist. My friend Dr. Gomez C., my mother and I flew up the coast to Trujillo; then across the Andes to Tarapoto. This trip proved interesting in that we were flying in a DC-4 which was unpressurized. The plane belonged to the Peruvian Air Force and was flying supplies to the interior. As we left Trujillo, they passed each person an oxygen tube, when we reached an altitude of about 12,000 feet the oxygen was turned on. We flew up a canyon with mountain peaks on each side of us, finally reaching an altitude of 16,500 feet. The trip across the Andes took about an hour and a half.

Tarapoto was a large Indian city when the Spanish first came to the area in the 16th Century. In 1967, it was a very primitive undeveloped small town by modern standards. Some streets were rain washed gullies just passable with a car. The city was not prosperous, nor were any of its inhabitants.

We went to the nearly new Brasila Hotel—said to be the best in town. One end of the room had a six foot high wall extending across the room making an area about 5 foot wide and ten foot long which contained a wash basin, toilet and the shower. When the water was run in the shower the area filled up with water about two inches deep. After several hours it would drain down to about an inch deep so that to use the toilet or basin one had to wade. Needless to say, it maintained an unpleasant odor.

We ordered chicken with rice that night. The chicken was selected from a pile of several, with wings and feet tied, at the end of the dining room. The chicken was butchered, ''cooked'', and served in about fifteen minutes. It was hot but nearly raw.

Across from my room was a community bathroom. The trap on the wash basin had a wooden plug which was removed so the water could drain into a bucket. When the kitchen needed water it was obtained from this source.

We criss-crossed the area south of Tarapoto several times to try to find *A. traubii* but in three days we were unable to find it. An occasional *A. belladonna* grew along the road.

In a canyon south of the dairy farm named Pucayaca—6 km. south of Tarapoto—we found #52. All the plants grew in a steep walled, narrow gully which was about 5 feet wide. They were scattered over a length of less than fifty feet. This plant was identified as a form of *A. traubii* and has been named *A. traubii* forma *doraniana* Moldenke (Fig. 8). The gully was sparsely covered with brush about 20 feet high creating a light shade.

We went on down the Huallaga river to the confluence of the Maranon. On the return trip over the Andes, we landed at Trujillo for fuel. When we started to take off, just as the wheels left the ground the exhaust manifold blew off of one engine. The pilot put the wheels back on the ground and applied the brakes. The runway ends at the beach. We stopped right at the end. I thought surely we would go into the breakers. They unloaded the freight and our baggage and the baggage of the other two passengers, feathered the prop, and flew the ship on to Lima for repair. Another plane picked us up four hours later.

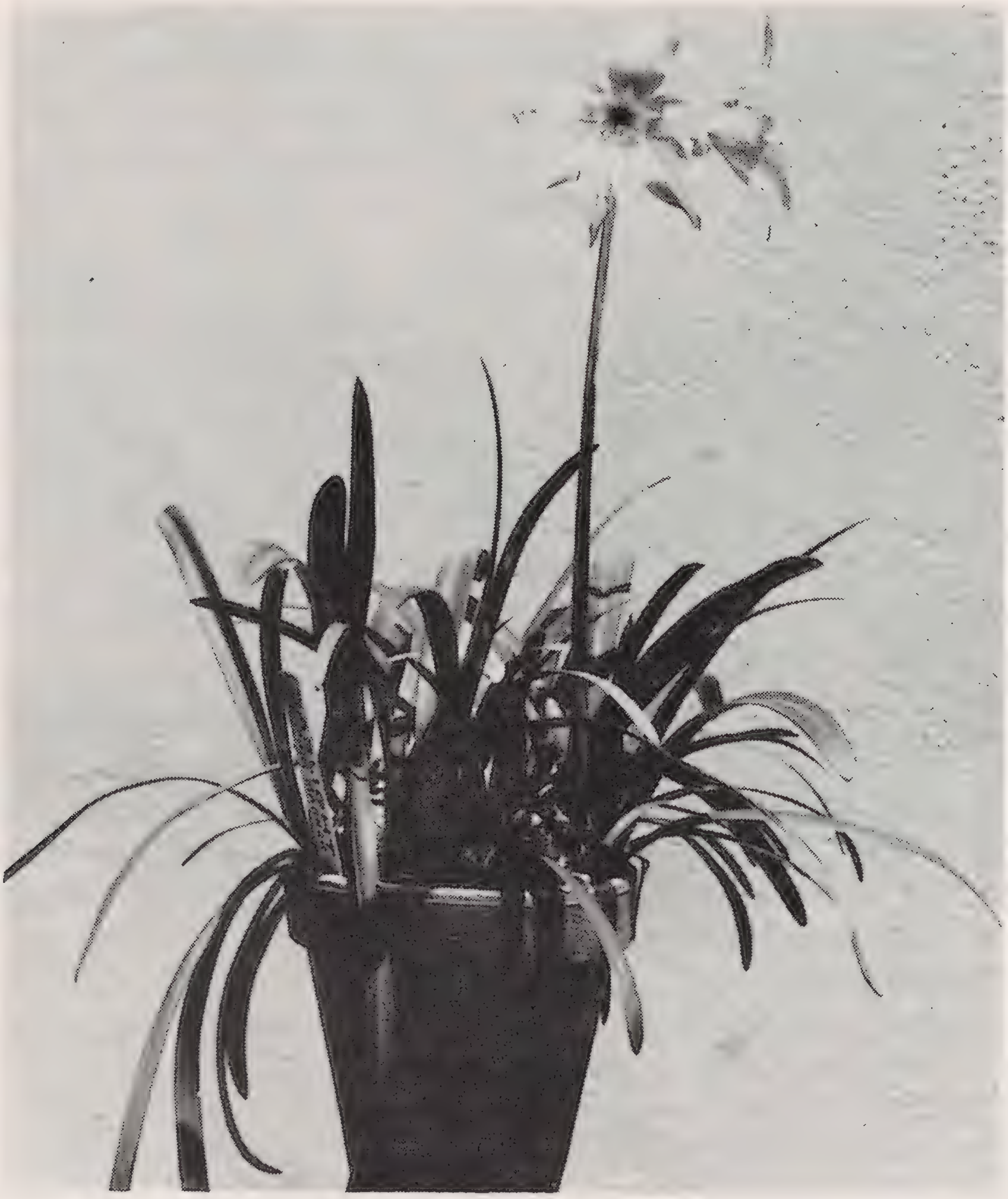


Fig. 8. **Amaryllis traubii** forma **doraniana** Moldenke. Photo by David Knudson.

I still wanted *A. traubii.* In September 1971, Hugh Bush and I went back to Tarapoto. We found many changes. When we were there in 1967, the *La Marginal* was just starting to be constructed. *La Marginal* is a road that the countries around the perimeter of the Amazon basin have pledged to build. It will allow colonization of the areas which it traverses and permit farm products to flow to market. Tarapoto started to grow beginning with the construction of *La Marginal* and today is enjoying prosperity. The streets have been graded, and five blocks of pavement have been put in. Most of the surrounding area is under cultivation. The principal crop is tobacco, all of which is flown to the coastal cities. As a result of man's encroachment upon nature there are practically no *Amaryllis* in the area of Pucayaca.

Before making the 1967 trip we discussed the area with Dr. Ferreyra, who found *A. traubii* in 1948. He gave us full details about the area. When we arrived we found considerable tobacco being grown and passable roads between Tarapoto, Juan Guerra and Shapaja. When we returned to Lima and told him about these changes he was amazed. Later, after he visited the area again in 1968, he told us that now he understood why we did not find *A. traubii.*

We visited the Lomos de Atacongo, where *Hymenocallis amancaes* used to grow without competition from other plants. Now it is smothered by European weeds. Dr. Ferreyra thinks that within a few years it will be completely killed out. The stocks of this fine species under cultivation should be carefully preserved so that it can be maintained at least under culture in the event that the native stands are crowded out by introduced weeds.

AMARYLLIS TRAUBII FORMA DORANIANA

HAROLD N. MOLDENKE

In 1950, Dr. Ramon Ferreyra, of Lima, Peru, collected plants of an *Amaryllis* species near Tarapoto, on the dairy farm Pucayaca, Dept. of San Martin, which he sent on to Dr. Harold N. Moldenke at the New York Botanical Garden. In 1952 this species was named *Amaryllis traubii* Moldk. This beautiful dwarf species unfortunately has been lost under cultivation.

Mr. J. L. Doran made attempts to recollect the species. However, the type locality had been plowed over and no trace of the species could be found there. Later, in 1967 Mr. Doran did find a dwarf *Amaryllis* near the type locality, which proved to be a form of the species. This plant with beautiful rose-colored flowers has been named for Mr. Doran whose perseverence brought it into cultivation.

Mr Doran, in a separate article appearing in this issue, discusses in detail the finding of this new form which makes a most fascinating account.

Amaryllis traubii forma *doraniana* Moldenke *forma nov.* (see Fig. 8)

Planta bulbosa, bulbo 4.5 cm. longo 5 cm. diametro; foliis 4 vel 5 sub linearibus 8—-12 cm. longis 1.9—2.2 cm. latis obtuse acutis; scapo

37 cm. longo; spatha 2-valvata; umbella biflora, floribus patentibus carminiroseis, fauce albido-viridescenti; pedicellis 1.5—3.3 cm. longis; ovario 7—8 mm. longo; tubo tepalorum usque ad 2.8 cm. longo; paraperigonio brevissime albo-piloso; segmentis tepalorum 7 cm. longis 1.5—3 cm. latis obtuse acutis; staminibus 3 cm. longis; stylo segmenta tepalorum aequanto; stigmate capitato, lobis 1 mm. longis.

HOLOTYPE: Doran s. n.; No. 1019 (TRA), July 5, 1972, grown from stock collected by J. L. Doran, in 1967, in Peru, 6 Km. south of Tarapoto, near the dairy farm of Pucayaca, Dept. of San Martin, near the confluence of the Rio Mayo and Rio Huallaga.

Bulb 4.5 cm. long, 5 cm. in diam., neck almost none, situated with neck of bulb even with the soil surface in nature; *leaves* 4—5, almost linear, narrowing somewhat toward the base, margins usually reddish, especially towards the base, grass green, somewhat sickle-shaped, up to 8—12 cm. long, 1.9—2.2 cm wide, apex very bluntly acute, *scape* hollow, only slightly compressed, glaucous, green, 37 cm. long, 7x10 mm. diam. (base), 4x6 mm. diam. (apex), *spathe-valves* 2, lanceolate, acute, scarious at anthesis, 4 cm. long; *umbel* 2-flowered, flowers wide open, carmine rose (HCC—621/1), throat pattern star-shaped, whitish, light greenish deeper in throat, flowers held more or less horizontally; *pedicels* green, 1.5—3.3 cm. long at anthesis; *ovary* oblong, green, 7—8 mm. long, 4—5 mm. in diam.; *tepaltube* greenish mottled reddish, up to 2.8 cm. long, widening toward the apex, 4 mm. wide (base), 7 mm. wide (apex); *paraperigone* of short, sparse, white hairs; *tepalsegs:* top, oblanceolate, 7 cm. long, 3 cm. wide; upper side segs, elliptic, 7 cm. long, 2 cm. wide; lower side segs, oblanceolate, 7 cm. long, 2.5 cm. wide; bottom seg, narrowly oblanceolate, 7 cm. long, 1.5 cm. wide; all segs with apex bluntly acute; *stamens* fascisculate, descending, recurved, whitish-greenish in lower half, light carmine rose above, subequalling the tepalsegs, but exserted; *style* as long as the tepalsegs, descending, recurved, whitish-greenish in lower ⅓, light carmine rose above; *stigma* trifid, deeper carmine rose, lobes about 1 mm. long.

AMARYLLIS CALYPTRATA KER-GAWLER

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Tremembe 02371, Sao Paulo, Brasil

This brazilian species is little known and few people grow it, even if they have a good number of natural species in their collection. The reason may be, that it flowers out of the season, when most *Amaryllis* bloom and so enters but few exhibitions; its green flowers are anyhow more an oddity than a show piece. Moreover it requires a care somewhat different from other species, so that there may be difficulty in growing it successfully. Yet this species has a character of its own, unforgettable and fascinating in colour, shape and even perfume, though the latter may not be approved by all nostrils.

The plant has it native haunts in the forest-clad dripping moist mountains of the Serra do Mar in southern Brazil, from Sao Paulo northwards to the Organ Mountains in the Rio de Janiero State and some mountain ranges of Espirito Santo. Almost anywhere it exists, it will grow as an epiphyte, on the mossy, gnarled trunks of trees, though rarely above ten feet from the ground. The thick, very succulent roots creep a long distance in the fissures of the bark, through a thin layer of dirt and moss, exploring occasional pockets of humus accumulations. It will bloom twice a year, first in January, that is mid-summer according to local conditions, and again in June, that means early winter in Brazil. The plant is in leaf the year round, and has no visible dormancy period.

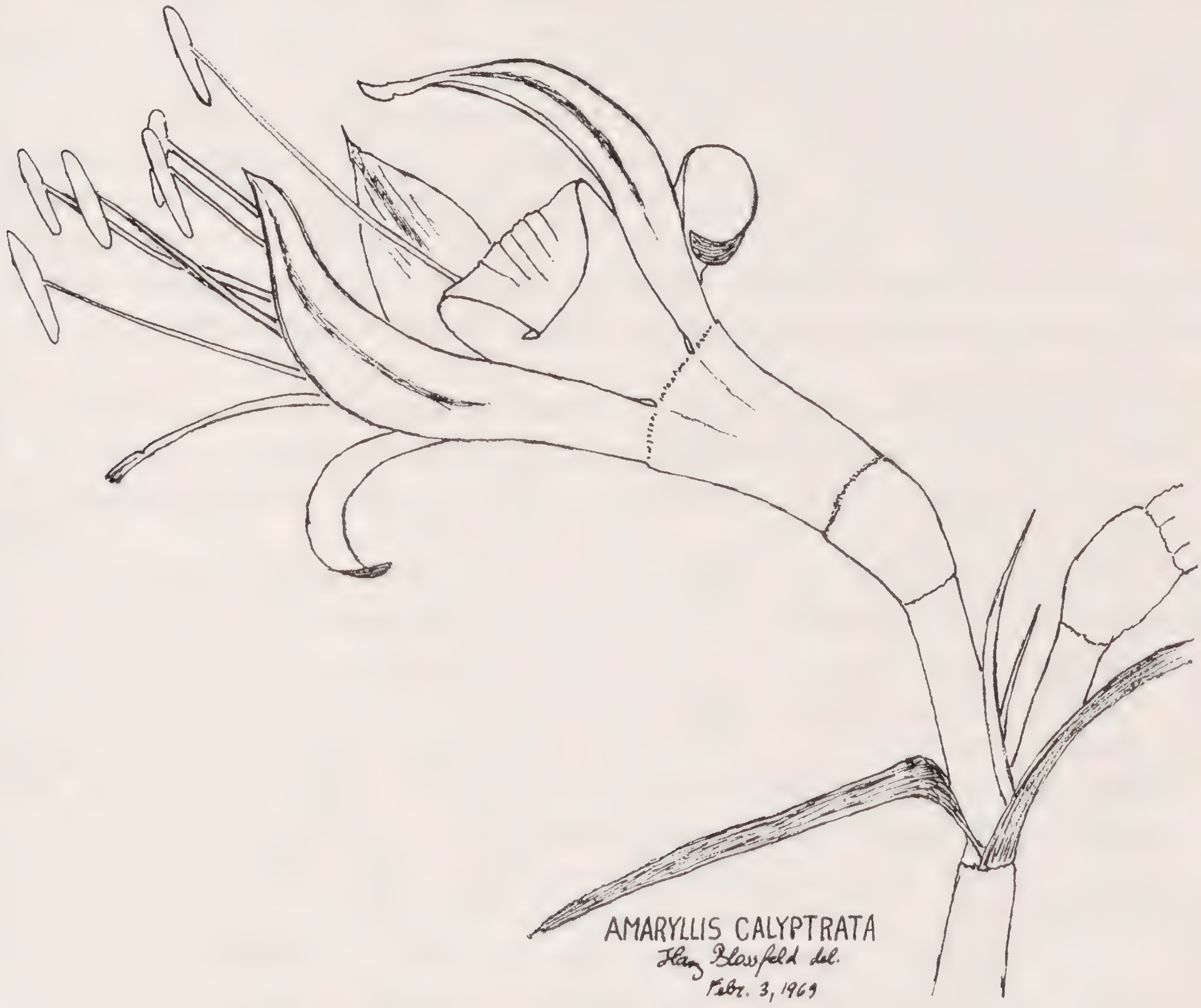

Fig. 9. Amaryllis calyptrata Ker-Gawler.

Though there are several, and correct, descriptions of *Amaryllis calyptrata,* I venture to give mine, based on habitat observations and on a good number of plants, I have been growing for several years.

Bulb rarely above 8 or 10 cm in diameter, pear-shaped, clothed by grey tunics and practically above the soil surface. Roots thick, mostly on the surface, covered by velvety hairs.

Leaves from 8 to 10, gutter-shaped, 50 to 60 cm long and at widest place 5 cm wide, minutely fluted by 18 to 20 parallel veins. The lower side has a prominent, sharp keel along the center. Leaf colour is a deep green on both sides, some plants showing a pale crimson hue on the under side near the base. The leaf tip ends in a narrow point. Foliage is persistent through all seasons.

Peduncle 60 cm long, hollow, sub-cylindrical, 2.5 cm in diameter near the base, tapering to 1.5 cm at tip, green, somewhat glaucous.

Spathe 8 cm long, by 3 cm broad, two-valved, valves boat-shaped, withering, though still green at anthesis. Two bracteoles present, 5 cm long by 0.3 cm broad at base.

Pedicels 4 cm long and 1 cm across, when flowers start opening, but considerably longer when pods develop, cylindric, green.

Ovary inflated trigonous, 2 cm long by 1.3 cm in diameter, darker green, set at an angle, thus supporting flowers in a horizontal position.

Flowers generally two, in an opposite position, rarely three on a stem. Buds, when emerging from spathe, show a remarkable trigonal shape, with sharp edges. When they start opening, it can be noted that the extremely long stamens inside are folded back like fish-hooks; at anthesis they stretch straight and one can see their struggle to disentangle by spasmodical movements, until they get free and out of the bud.

Corolla soldered at base into a conical tube of 2.5 cm in length. On the inside, this tube is closed by a green paraperigone that has the shape of a bladder with a triangular slit, through which stamens and style connect with the ovary. The cartagilous rim of this paraperigone is somewhat undulated and where it is soldered to the tube, on the outside is a clearly marked ring of tiny depressions.

Perigone has a peculiar shape, to which the name ''calyptrata'' alludes; calyptra means a hood. As before stated, the three outer segments are stiffened by a thick and prominent ridge running lengthwise along the center, thus giving the bud its trigonal shape. When the flowers open, this reinforced ''backbone'' of the outside segments keeps them in an inwardly curved position and prevents the flower from opening wide. Consequently, the inner segments are unable to spread open and just pierce their tips through the clefts between the outer segments, rolling them finally to a spiral, in the vain effort to spread wider. The lowermost inner segment, being only 2.2 cm wide, has more room to spread and does so promptly, when the bud opens, curving back too, after a few days.

While this fantastic shape of a flower develops, the observer witnesses another exciting show. The stamens, hooked back while inside the bud, at first straighten and after a day, their enormous anthers, full 2 cm long and pale lilac, split lengthwise and tuck outside in, showing the greenish-yellow pollen, while they shrivel to a mere 0.8 cm length in two days. While this happens, the pale pink stamens stretch amazingly in length, until they protrude out of the flower to a full 15 cm (6″) length; but they do not just gow longer; at the same time, they bend and twist, reacting quickly to changes of light direction and incidence of the sun. Finally they end their dance by bending their tips upwards. The style remains bent downwards during the first three days, then stretches to full 18 cm in length and finally bends up near the tip, staying in front of the anthers. The trifid stigma unfolds reluctantly and spreads on the last days of life of the flower.

The most unusual colour of this flower is green, though some authors indulge in calling it yellowish-green or whitish-green, its general appearance is frankly green. On close inspection, one discovers, that the green colour is most decidedly present on the veinings, while what little space is left between these dense reticulations, is somewhat paler green and when the flower got past its best, some yellowish or whitish shades appear. A keen observer may even discover a tiny red rim along the edge of all flower segments, but it is so narrow, that one remains unsure about it, unless one uses a lens. A faint purplish hue is also present on the outside of the flower spathe and, as stated above, style and filaments are pink, except at their bases which are green.

This flower cannot be called a great beauty, but it is unusual and spectacular, it has a formal character and colour of its own and another feature is the strong perfume of exotic aroma, most active during the night. It possibly acts as an attraction for some big green bug, which has a similar smell and may be responsible for pollination. But the humming-birds too, are not quite innocent about the amorous life of this flower.

As to cultivation, it must be remembered, that the plant is evergreen, requiring light and water during the whole year. Furthermore it must be considered, that it comes from a rather cool mountain area (abt. 3000 feet altitude), with average temperatures of 65° F, with but little variations during the seasons (59° F to 70° F). It gets an immense rainfall of 160 inches per year and whenever it does not rain, dense fogs are sure to prevail each evening and morning. The permanent moisture is its epiphythic need; growing on trees, rains drain off immediately and there is no danger of the roots becoming asphyxiated in a waterlogged soil, because they are mostly superficial.

Traducing these facts into the practice of cultivation, it is first evident, that this species, contrary to most others, has no resting period and requires no dormancy. It requires high atmospheric humidity and a shady, cool place in the greenhouse. It should be potted high, that is, with the bulb entirely above the soil surface, and a very porous potting medium is advisable. This not only requires more frequent watering, but also implies regular fertilizing. Like most epiphythic plants, *Amaryllis calyptrata* is rather sensitive to high fertilizer concentrations and solutions above 1 : 1000 of any fertilizer formula, should be avoided. Very diluted fertilizer applicated frequently between plain water hosings is much better than strong solutions given two or three times per year, as other *Amaryllis* species of short growing cycle may take easily.

A curious fact may be remembered. The closest relative species is *Amaryllis fosteri* Traub, a species growing in one of the driest desert regions of Brazil, perfectly adapted to resist extreme drought conditions, tropical heat and very little shade.

NOTHOSCORDUM MAHUII SP. NOV.

Hamilton P. Traub

This tiny but very attractive plant flowered at La Jolla, Calif. in 1972. The flowers are long lasting, and relatively large for such a dwarf plant. A number of bulbs should be planted in a 3-inch pot in order to make a fine showing.

After flowering, the leaves die down, and the plant remains dormant until the next winter. Thus the dormant plants in pots should be stored with minimum watering during the rest of the year.

The plant has been named for Sr. Manuel Mahu, the plant scientist at the University of Chile, who is very active in collecting plants in Chile, and who shares some of his treasures with the writer.

Nothoscordum mahuii Traub, **sp. nov.**

Planta bulbose, bulbo parvo; folis 4 linearibus 8—10 cm. longis; scapo 5.5—6 cm. longa; spatha 2-valvata infra medium leviter connata; umbella triflora; floribus albis, segmentis tepalorum purpurascentibus; pedicellis 3.5 mm. longis; tubo tepalorum 1 mm. longo; staminibus 6 biseriatis 1.5—3 mm. longis; stylo 2 mm. longo; stigmate obtuse 3-lobato.

Holomenifer: Traub No. 1021 (TRA), grown at La Jolla, Calif. from stock collected Aug. 10, 1970 by Manuel Mahu at Cuesta Barriga, alt. 350 m., Prov. Santiago, Chile.

Plant winter-flowering, *bulb* small. *Leaves* 4, green, linear, very slightly channeled above, very slightly rounded on the back, 8—10 cm. long, 1—1.3 mm. wide, apex bluntly acute. *Scape* (two produced on nomenifer plant), green, very slightly flattened, 5.5—6 cm. long, 1x1.3 mm. in diam. *Spathe-valves* 2, lanceolate, 13 mm. long, united for 3 mm. at the base, purplish-greenish in lower part, striated purplish above. *Umbel* 3-flowered; flowers white, tepalsegs keeled purplish, the color showing through on the inside, each tepalseg marked, on both sides, for ¼ of its length from the base, with a very thin purplish line. *Pedicels* shorter than the spathe, 3.5 mm. long, 2.5 mm. in diam. *Ovary* globose, white, 3.5 mm. long, 2.5 in diam. *Tepaltube* funnel-shaped, 1 mm. long. Tepalsegs 6, oblong, 11.5 mm long, 5—6 mm. wide, bluntly acute. *Stamens* 6, attached at the mouth of the tepaltube, in 2 series, 3 sepaline 1.5 mm. long, 3 petaltine 3 mm. long; anthers 1 mm. long, pollen yellow. *Style* white, 2 mm. long, stigma bluntly 3-lobed.

THE "WINE-COLORED" HYBRID CRINUM 'ELIZABETH TRAUB'

Hamilton P. Traub

The beautiful hybrid, *Crinum,* 'Elizabeth Traub' (Traub, 1947) was produced by the writer in the 1930's while resident in Florida by crossing the hybrid *Crinum* 'Ellen Bosanquet' (Bosanquet, 1935) on *Crinum scabrum* Herb (see Hannibal, 1947, 1972). Hayward (1935, 1948) has touched on the history of 'Ellen Bosanquet'. The merits of the hybrid 'Elizabeth Traub' have been discussed by Hannibal (1947, 1972) and Howard (1960). Recently the writer has observed this hybrid for a few years at his new home growing under similar conditions with the earlier hybrid 'Ellen Bosanquet' thus facilitating comparisons. The information has been assembled in the following table.

Character	**'Ellen Bosanquet'**	**'Elizabeth Traub'**
Parentage	Originated by Louis Percival Bosanquet, of Fruitland Park, Fla See Hayward, 1935, 1948	**Crinum scabrum** Herb ♀ x hybrid 'Ellen Bosanquet' ♂
Bulb	Medium sized, producing offsets sparingly	large, producing offsets freely
Plant size	similar to 'Elizabeth Traub' but smaller	similar to 'Ellen Bosanquet' but larger and more vigorous
Flowering habit	flowering once each season	flowering is recurrent
Flowers per umbel	up to 8	up to 14 or more
Flower color	Strong purplish red (Nickerson Color Fan); 7.5 RP 4/11 to 7.5 RP 5/11. Referred to in the literature as "wine-color"	similar to that of 'Ellen Bosanquet'
Stamen-filament and pollen color	filaments white; pollen creamy to gray	similar to that of 'Ellen Bosanquet

LITERATURE CITED

Hannibal, L. S.—Semi-hardy Crinums. Herbertia *14*: 187-192. 1947.

--------. Garden Crinums. Bull. Louisiana Soc. Hort. Res. Vol. 3: No. 5. pp. 215—322. 1971-1972.

Hayward, Wyndham—Louis Percival Bosanquet and his Crinums. Herbertia *2*: 100-101. 1935.

--------. Crinums for Garden and Greenhouse. Herbertia *15*: 139-145. 1948.

Howard, Thad M.—Highly colored Crinums and a New Hybrid. Plant Life *16*: 107-110, 100. 1960.

BOLIVIAN AMARYLLIDS

MARTIN CARDENAS, *F. M. L. S.*
P. O. Box 538, Cochabamba, Bolivia

Amaryllis leopoldii forma **Whitakeri** Card. **sp. nov.**

Bulbo globoso 5-7 cm long., 6-7 cm crasso. Pseudocollo 7-9 cm long. Folis loratis 40-50 cm long., atro viridis. Scapo subterete 25-35 cm long. Umbella 3 flora. Bracteis spathaceis lanceolatis 8 cm long., cremeis, purpura lineatis. Pedicellis 3-6 cm long. Perigonio 13-15 cm long., 15-17 cm lato. Ovario 16-20 mm long. Tubo 5 mm long. Setepalsegmentis 11-12 x 4 cm, extus a basim atro viridis, dein cremea rubro lineatis, intus inferne diluto viridis, superne rubi sanguineo lineatis, Petepalsegmentis similia coloribus tamquam setepalsegmentis. Paraperigonio dilutissimo viridis albo pilegerus. Staminibus 8-9 cm long. Filamentis inferne diluto viridis, superne rubro purpureo. Stylo 11.5 cm long. inferne temperato viridis, superne purpureo. Stigma trilobato diluta purpureo.

Patria:—Bolivia, Provincia Chapare, Departamento Cochabamba, prope Peñon de San Julian 2,000 m.

Bulb 5-7 cm long, 6-7 cm broad. *Neck* 7-9 cm long. *Leaves* lorate dark green 40-50 cm long, 4 cm wide narrowing at the base. *Scape* subterete 25-35 cm long, 1.5-2 cm thick, purplish below. *Umbel* 3 flowered. *Spathe* bracts lanceolate 8 cm long cream, purplish striped. *Pedicels* 3-6 cm long, light green. *Perigone* 13-15 cm long, 15-17 cm limb. *Ovary* 16-20 mm long hexagonous. *Tepaltube* 5 mm long. *Setepalsegments* 11-12 x 4 cm, dark green at base, cream red striped above with a green middle keel outside, light green at base and densely blood red striped inside. *Petepalsegments* quite of the same size and color of setepalsegments. Lower segment only 3 cm wide. There is a light green star 2.5 cm long inside. *Paraperigone* very light green, white haired. *Stamens* shorter than tepals. *Filaments* very light green below, purple red above. *Anthers* 5 mm long. *Style* 11.5 cm long, light green below, red purple above. *Stigma* trilobate, light purple.

Bolivia.—Province Chapare. Department Cochabamba, Peñón de San Julian, 2,000 m. July, 1971, M. Cárdenas, No. 6331 (Type in Herbarium Cardenasianum).

Obs. This species which grows at the same locality with *A. divi-Julianus* Cárd., differs from this by its striped tepal colour. This recalls also *A. lapacensis* dark coloured varieties, but differs by its larger flowers which are semierect and with slightly undulate tepals as in *A. aulica.* The red stripe lines in this new species are somewhat undulate and netted. Its 2 upper petepalsegments bear a solid red middle section. Differs also from *A. lapacensis* by its broader tepals, colour of filaments and style.

This new taxon with the largest flower in the genus and handsome appearance, is named after the well known geneticist and courageous botanical explorer Dr. Thomas W. Whitaker.

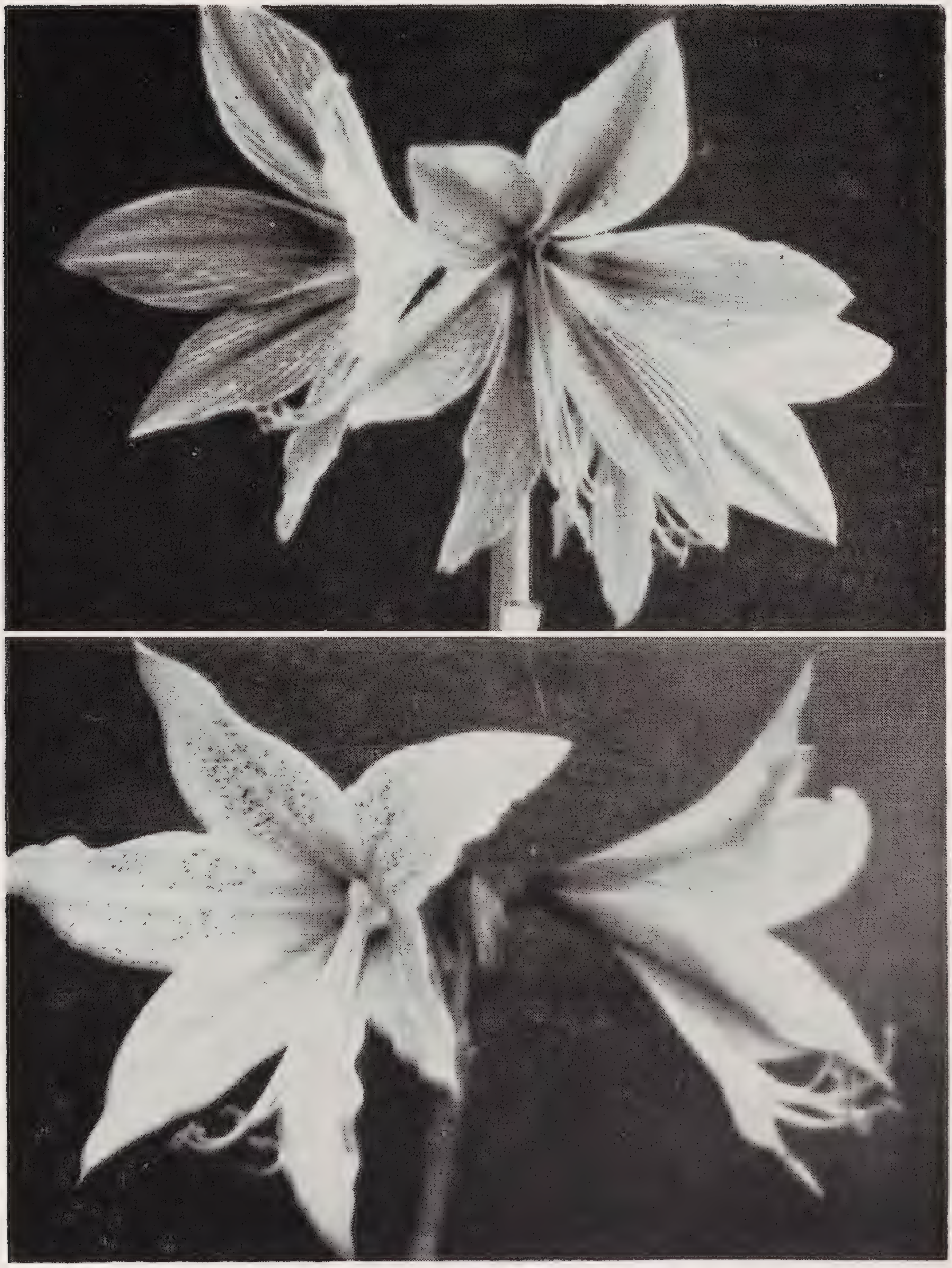

Fig. 10. Upper, **Amaryllis leopoldii forma whitakeri** Cardenas, sp. nov., and lower, **Amaryllis paquichana** Cardenas, **sp. nov.**

Amaryllis Paquichana Card. **sp. nov.**

Bulbo conico 5 cm long. 4 cm crasso. Pseudocollo 3 cm long. Folis lanceolatis 20-30 cm long. 2-2.5 cm latis. Scapo 25-35 cm long. Umbella 2 flora. Bracteis 4-6 cm long. purpureis. Pedicellis 3 cm long. Perigonio actinomorpho 9 cm long. 10-11 cm lato. Ovario 1-1.5 cm long. Tubo 3-5 mm long. Setepalsegmentis 7 x 3 cm, lanceolatis, margine parce undulatis, extus dilutissimo viridis a basim obscurioribus, intus a basim temperato viridis, dein minutissimo purpura punctatis. Petepalsegmentis 7.5 x 2 cm oblongo lanceolatis, margine crispus similia coloribus tamquam setepalsegmentis. Paraperigonio albo pilosus. Staminibus 6-7 cm long.; filamentis albis. Stylo 7.5 cm long., inferne albo, superne purpura punctato. Stigma purpura, capitata.

Patria:—Bolivia. Provincia Caupolican. Departamento La Paz, prope Paquicha, 1,000 m.

Bulb conic 5 cm long, 4 cm broad. *Neck* 3 cm long. *Leaves* lanceolate 20-30 cm long, 2-2.5 cm wide, acute, narrowing at base. *Scape* 25-35 cm long, terete, green, 15 mm thick at base, narrowing to 10 mm above. *Umbel* 2 flowered. *Spathe* bracts 4-6 cm long, lanceolate 1.5 cm wide, purplish. *Pedicels* 3 cm long. *Perigone* regularly actinomorphe 9 cm long, 10-11 cm limb. *Ovary* 1-1.5 cm long, green. *Tepaltube* 3-5 mm long. *Setepalsegments* 7 x 3 cm, lanceolate very light green to yellowish, dark green at base with a light green keel fading toward the tips outside, light green at base and very minutely purple spotted inside. *Petepalsegments* 7.5 x 2 cm, oblong lanceolate, same coloured as setepalsegments. All segments curled at margins. *Paraperigone* well developed, white haired. *Stamens* 6-7 cm long; filaments white. *Style* 7.5 cm long surpassing tepals, white below, purple spotted above. *Stigma* capitate, purple.

Bolivia.—Province Caupolican. Department La Paz, on the way down to Paquicha, Machariapu River Basin, 1,000 m. August 1971, E. Meneses No. 6332 (Type in Herbarium Cardenasianum).

Obs.—This pretty gracile flowered *Amaryllis,* comes from the northwestern region of the Province of Caupolican not far from Sandia. in Perú, the zone from where *A. fusca,* was collected. *A. paquichana* is characterized by its very clear green-yellowish flowers with finely purple spotted tepals. When collected in full blooming period it was leafless.

Zephyranthes Cutleri Card. **sp. nov.**

Bulbo globoso 4-5 cm long. 3-7 crasso, bracteis nigrescentis tecto. pseudocollo 3-15 cm long. nigrescente. Folis 16 cm long., 5 mm latis atro viridis. Scapo 25-30 cm subcylindrico, diluto viridis vel glaucus, superne angustato. Bractea spathacea 3-5 cm long., tenuissima. Ovario 10-15 mm long. Perigonio 7-9 cm long., 5 cm lato. Tubo 15-18 mm long., diluto aurantiaco. Setepalsegmentis 5 x 1 cm, lanceolatis, mucronatis, aurantiaco viridis. Petepalsegmentis lanceolatis 55 x 8 mm, aurantiacus. Staminibus brevioribus 56 mm long., longioribus 58 mm long. diluto aurantiacus. Stylo 68 mm long., inferne aurantiaco, superne aurantiaco lilacino. Stigma lato trifida viridiscenti. Capsula 4 cm long., 1.5 cm crassa, trigona. Semina semiovata, membranacea brunescentia 8 mm long.

Patria:—Bolivia. Provincia Ayopaya. Departamento Cochabamba, prope Morochata, 2,900 m.

Bulb globose 4-5 cm long, 3-7 cm thick covered by blackish bracts. *Neck* 3-15 cm long, blackish. *Leaves* dark green 16-18 cm long, 5-8 mm wide somewhat striate beneath. *Scape* 25-30 cm long, subcylindric hollow, light green to glaucous, 6-8 mm thick, narrowing at apex. *Spathe* bract 3-5 cm long, very thin, white, membranaceous, opening above in two or three sections. *Ovary* sessile 10-15 mm long, light green subcylindric and covered by the spathe bract at anthesis. *Perigone* 7-9 cm long, 5-6 cm limb. *Tube* 15-18 mm long, light green 3-6 mm thick. Outer perigone segments 5-6 x 1 cm, lanceolate mucronate curved at its middle section, bright orange to red. Inner segments lanceolate 4 x 1 cm, orange red. *Stamens* three slightly longer than the other three 58 and 56 mm long, light orange, inserted to tepals 8 mm above ovary into the tube. *Style* 68 mm long, orange below, lilac orange above. *Stigma* trifid, orange, with 3 mm long, expanded green lobes. *Fruiting scape* 60-63 cm long dark green to glaucous, 11 mm thick at base. *Capsule* elliptic, 4 cm long, 1.5 cm thick, trigonous. *Seeds* flattened 5-6 mm long, black white winged.

Bolivia.—Province of Ayopaya. Department of Cochabamba. Above Morochata, 2,900 m. March 1971, M. Cárdenas No. 6333 (Type in Herbarium Cardenasianum).

Obs.—This new species was collected by us at different localities several years ago but always under the same ecological conditions. The localities of our collections, were Sivingany on the way to Vila Vila, 2,900 m, Prov. Mizque, Dep. Cochabamba, Km. 65 on the way to Sta. Cruz, 3,000 m, Prov. Arani and Morochata, Prov. Ayopaya, Dep. Cochabamba, the type locality. The three localities were on grassy mountain rather humid slopes.

Our duplicates were sent to the National Herbarium at Washington, D. C. and identified by Dr. L. B. Smith as *Zephyranthes tubiflora* (L'Hérit.) Schinz. Now, when we are better acquainted with the Bolivian Amaryllids, we can say that this identification is obviously erroneous, because of the color and structure of flowers and the geographical distribution of the species. This is named after the well known Bolivian flora explorer, Dr. Hugh C. Cutler.

Zephyranthes Albolilacinus Card. **sp. nov.**

Bulbo conico 4 cm long. tenui cataphylla tecto. Pseudocollo 3-4 cm long. Scapo 18-25 cm long. unifloro. Bractea spathacea 3-3.5 cm long. membranacea. Pedicelli 2 cm long. Ovario 8 mm long. Tubo

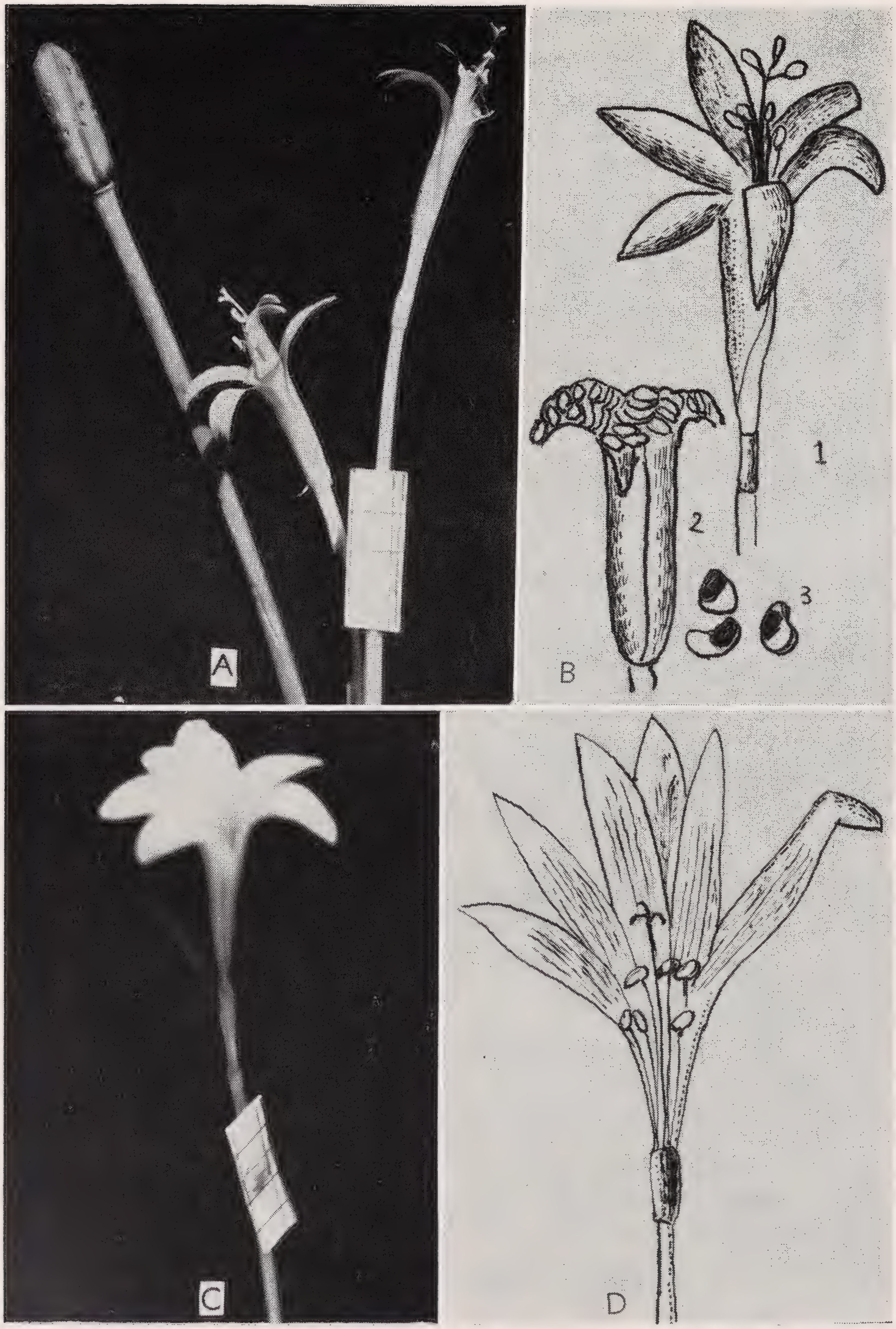

Fig. 11. Upper, **Zephyranthes cutleri** Cardenas, **sp. nov., A,** flowers and capsule; **B,** 1, flower; 2, opening capsule and 3, seeds, X .86 Lower, **Zephyranthes albolilacina** Cardenas, **sp. nov., C,** flower, and **D,** opened flower showing stamens, style and tepalsegs, X. 86.

infundibuliforme 2.5 cm long. viride purpureis. Perigonio 7-8 cm long. 6 cm lato. Tepali segmentis 6 cm long. 10-13 mm latis, albo lilacinis, fusi formibus. Staminibus minoribus 15 mm long., longioribus 18 mm long. Stylo 3.6 cm long. Stigma trifida.

Patria:—Bolivia. Provincia Cercado. Departamento Cochabamba. Monti Tunari, 3,500 m.

Bulb conic 4 cm long, 3.5 cm broad covered by thin brown cataphyls. *Leaves* not seen at anthesis. *Pseudostem* 3-4 cm long. *Scape* hollow, 18-20 cm long, 4 mm thick green above, purplish below, bearing a single flower. *Spathe* bract 3-3.5 cm long, membranaceous light brown, greenish tipped. *Pedicel* 2 cm long. *Ovary* covered by the spathe bract, 8 mm long, 4 mm thick. *Tepaltube* funnelform 2.5 cm long, green purplish. *Perigone* 7-8 cm long, 6 cm limb. *Tepals* equal, 6 cm long, 10-13 mm wide, white, finely lilac striped, fusiform. *Stamens* of two size, inserted 5 mm above tepals base; short ones 15 mm long, long ones 18 mm long. *Filaments* white; anthers 6 mm long. *Style* 3.6 cm long slightly longer than stamens. *Stigma* trifid with 3 mm long filiform lobes.

Bolivia:—Province El Cercado. Department of Cochabamba, above San Miguel on Mount Tunari, 3,500 m, September 1969, M. Cárdenas, No. 6334 (Type in Herbarium Cardenasianum).

Obs.—This pretty Amaryllid seems unlike any species of the genus we know from Bolivia. It is characterized by its regular gracile flowers which emerge from the grassy mountain slopes at anthesis at the beginning of spring.

THE GENUS **HAYLOCKIA** IN BOLIVIA

Martin Cardenas. *F.M.L.S., P. O. Box 538,*
Cochabamba, Bolivia

The Genus *Haylockia* is as yet not clearly defined. It was separated from *Zephyranthes* and also related to *Pyriolirion.* Robert C. Foster in his Catalogue of Ferns and Flowering Plants of Bolivia, includes in the genus the following species: *Haylockia andina* R. E. Fries from Argentina, *H. pseudocolchicum* (Kränz.) Hume from Bolivia and *H. pseudocrocus* Solms-Laubach from Bolivia.

Dr. H. P. Traub in his Genera of Ameryllidaceae, 1963, maintains the Genus *Haylockia,* as a valid entity giving its generic characters on the basis of the single species accepted, *H. pusilla* from Uruguay. These characters refer particularly to the scape hidden in the bulb, the umbel with a single erect flower which is regular, white, pale rose or yellow, the stamens inserted in the throat of the tepaltube, the stigma trifid and the seeds black, dorsally convex.

Prof. Kränzlin in describing *Zephyranthes pseudocolchicum* from Bolivia, includes it in the Section *Pyrolirion* and states that it can not be related to *Haylockia* since in this genus the stamens are inserted at two different levels.

For now, what is worthwhile is the knowledge of the species which are poorly represented in the herbaria and dubiously described in some cases. In the future, when living material becomes available, we shall have more accurate taxonomic criteria on the basis of cytogenetic techniques.

In the following account we shall refer to the taxa collected by us in Bolivia during the last two years.

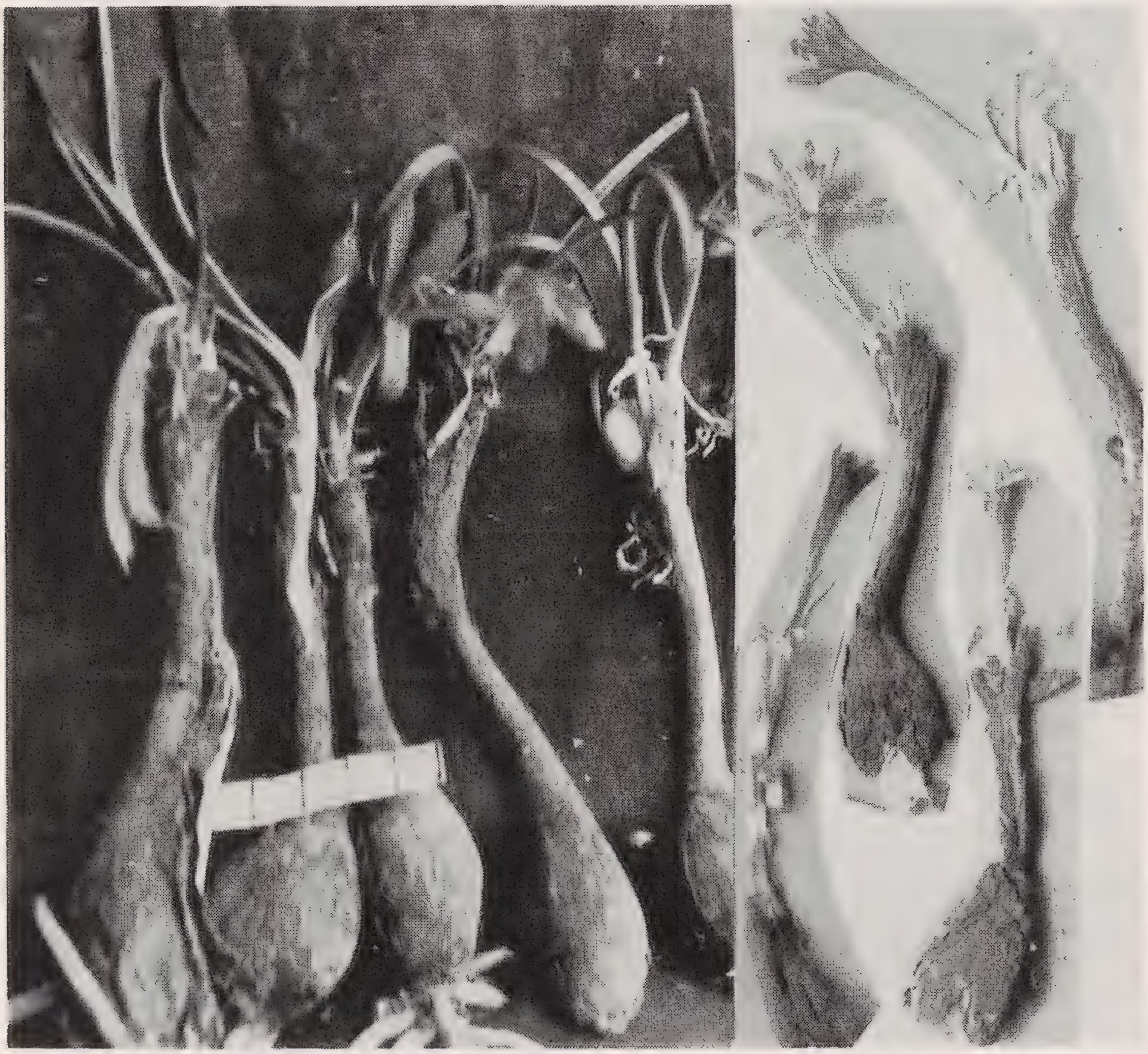

Fig. 12. Left, **Haylockia pseudocolchicum** Kraenzlin, X 0.30; right, **Haylockia chihuanhuayu** Cardenas, **sp. nov.** X 0.30.

Haylockia pseudocolchicum (Kraenzl.) Hume (see Figs. 12 & 13-C)

Proc. Fla. Acad. Sci. 2: 91. 1938, in obs.; Syn.—*Zephyranthes pseudocolchicum,* Fedde, Rep. Bd. 13: 118. 1914.

This rare plant was collected by Prof. Th. Herzog at Cerro de Oruro, Bolivia, 3,950 m. November 1911. Last year, we again collected the same species at its type locality in rocky crevices. Professor F. Kränzlin's Latin diagnosis is quite accurate. However we think that the following description from complete living specimens might be useful:

Bulb conic 6-7 cm long, 2.5 cm thick, covered by brown cataphylla. Roots about 6, white, 6-10 cm long, 3-4 mm thick. Pseudostem 9-15 cm long sheathed by bulb cataphylla. *Leaves* well developed at anthesis about 7, included in more than its half length into the neck sheaths, yellow in their hidden section, green at its free tips. *Scape* solid about 10 cm long, included into the pseudostem sheaths, white, 3 mm thick. *Ovary* sessile, 1 cm long, 7 mm thick trigonous, light green. *Spathe* bract membranaceous, 5 cm long, covering the ovary, white, greenish tipped. *Tepaltube* funnel form 4.5 cm long, whitish below, brick red above. *Perigone* zygomorphic 7 cm long, 4 cm limb. Outer tepals lanceolate 23 x 5 mm. Inner lanceolate the two lower ones 2 cm long and the upper 2.3 cm long. *Stamens* inserted at the tepals base forming a tube with its expanded lower parts, 12 mm long. Free section of filaments 3 mm long. *Filaments* yellow reddish. *Anthers* 4 mm long, yellow. *Style* 7 cm long, white below, yellowish above, very thin. *Stig-*

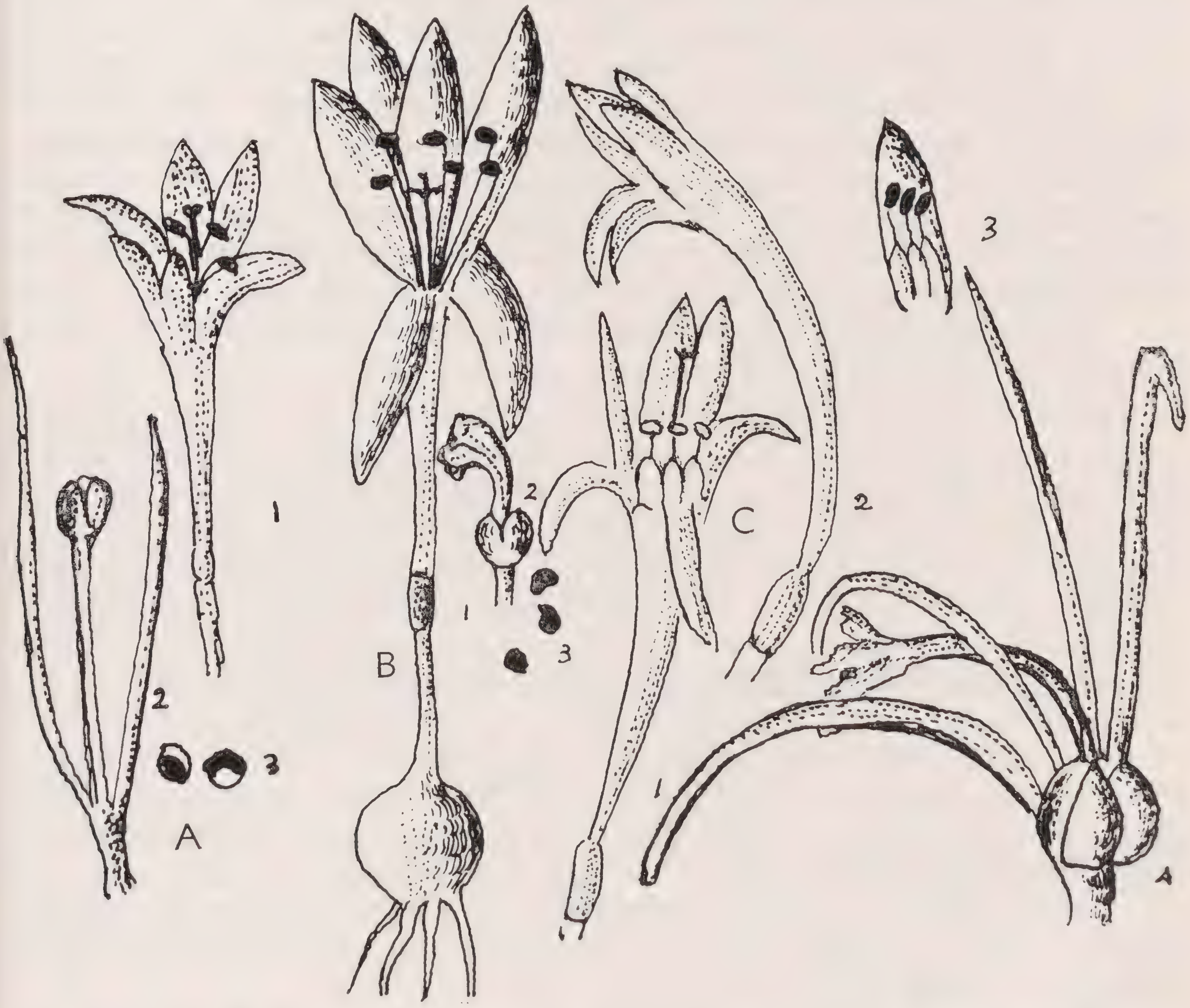

Fig. 13. **A.** Haylockia chihuanhuayu Card. sp. nov. 1, flower; 2, leaves; 3, seeds. X 0.90. **B. Haylockia cochabambensis** Card. sp. nov. 1, plant; 2, capsule; 3, seeds, X 0.90. C. **Haylockia pseudocolchicum** Kreanzlin, 1 & 2, flowers; 3. stamens; 4, fruit. X 0.90.

ma trilobate greenish about 2 cm overtopping stamens which are inserted at the same level. *Fruit* globular trilocular 15 mm in diameter purplish. On fruiting specimens the leaves are 10-12 cm long. 3-4 mm wide, canaliculate, dark green. *Seeds* in one pile at each locule, elliptic to circular, black, 6-8 mm long.

Haylockia Chihuanhuayu Card. **sp. nov.** Fig. 12 & 13-A

Bulbo fusiformibus 3.5-4.5 cm long. 7-14 mm crasso. Pseudocollo 4-7 cm long. brunea cataphylla tecto. Scapo 3-7 cm long. solidus fere integer pseudocollo incluso. Folia sub anthesia nulla. Bractea spathacea tubulosa albo hyalina. Ovario subcylindrico, 1 cm long. sessilis. Tubo 4-5 cm long. 3 mm crasso. Perigonio 3 cm long. Tepals lanceolatis 2-2.5 cm long., 5 mm latis, aurantiacus, mucronis albis. Stamina ex basim petalis, aequantes. Stylo aliquid stamina superans. Stigma capitata. Fructo globulous 6 mm diam. Semina semilunaris 5 mm long. nigra.

Patria:—Bolivia, Provincia Fraias. Departamento Potosi, prope Laguna San Sebastian, 4,070 m.

Bulb fusiform, 3.5-4.5 cm long, 7-14 mm thick. Pseudoneck 4-7 cm long, 4-5 mm thick, covered by brown cataphylla. *Scape* solid 3-7 cm long covered by the cataphylla. *No normal leaves* at anthesis except some young linear ones. *Spathe* bract tubular, white hyaline, covering the ovary which is subcylindric, sessile 1 cm long and light yellow. *Tube* slender 4-5 cm long, 3 mm thick above ovary, whitish. *Perigone* 3 cm long, 2.5 cm limb. *Tepals* lanceolate 2-2.5 cm long, 5 mm wide orange with whitish mucrons. *Stamens* of the same size, inserted at the base of tepals, orange yellowish. Filaments expanded at its base and fusioned except at its top section. *Style* little longer than stamens, very thin, light yellow. *Stigma* capitate dark green, 1 mm diam. *Fruit* globular 5 mm high, 8 mm thick, green. *Seeds* semilunar, black, 5 mm long with a narrow membranaceous white wing.

Bolivia. Province Frias, Department of Potosi, Laguna de San Sebastian, 4,070 m. March 1972, M. Cárdenas, No. 6336 (Type in Herbarium Cardenasianum).

Obs.—At first, we thought that these plants so popular as a legendary element in our folklore, under the name ''chihuanhuayu'', might be identical with *Haylockia pseudocolchicum* (Kränz.) Hume. However, we now see it as a different species due to its smaller bulbs, shorter pseudoneck, leaves not well developed at anthesis, more regular perigone and the capitate stigma.

Haylockia Cochabambensis Card. **sp. nov.** Fig. 13-B

Bulbo globoso bruneo 2.5 cm long. 1.5 cm crasso. *Pseudocollo* 3-3.5 cm long. Folia linearia 10-20 cm long. 2-3 mm lata, atro viridia. Scapo solido 2-2.5 cm long. in pseudocollo incluso. Bractea spathacea tubulosa 2-3 cm long., membranacea alba, apice viridia. Ovario 5 mm long. Tubo 3.5 cm long. Tepals oblanceolatis 4 x 1 cm, albis, apice lilacina viridis. Stamina ex basim tepalis. Stylo 15 mm long. non stamina superans, trifidus, Fructo trilobulato. Semina lunularia, nigra, 6 mm long.

Patria:—Bolivia, Provincia Cercado. Departamento Cochabamba, prope Cerro San Pablo, 2,800 m.

Bulb roundish, 2.5 cm long, 1.5 cm thick covered by a thin brownish cataphil. Roots fibrous, 4-5 cm long. Pseudoneck 3-3.5 cm long. Leaves linear 10-20 cm long, 2-3 mm wide grooved, dark green. Scape 2-2.5 cm long. solid, light green, 3 mm thick hidden into pseudoneck. Spathe bract tubular 2-3 cm long, white membranaceous green tipped. Ovary 5 mm long, light green, as thick as scape. Tepaltube 3.5 cm long, white greenish. Tepals oblanceolate 4 x 1 cm white greenish below, lilacine above. Stamens inserted at the base of tube, of two size 7 and 11 cm long. Filaments white; anthers yellow. Style 15 mm long, white. Stigma trifid, yellow much lower than stamens. The flowers turn purple lilac when dry. Fruit trilobular, green, 6 mm diam., septicidal. Seeds lunulate, black 6 mm long in two piles at each locule.

Bolivia. Province El Cercado. Department of Cochabamba. Cerro de San Pablo East Cochabamba, 2,800 m. M. Cárdenas, No. 6337 (Type in Herbarium Cardenaisianum).

Obs.—This species is quite different in the Genus *Haylockia* from the other two above described. However, considering its solid scape and other characters it can't be placed in *Zephyranthes*. It is also different from the *Pyrolirion* representatives we know from this country.

A VANISHING MEXICAN **HABRANTHUS?**

Mrs. Katherine L. Clint, *2005 Palm Boulevard,*
Brownsville, Texas 78520

On July 30, 1955, growing with *Habranthus concolor* near San Luis Potosi, Mexico, we found a few bulbs (Clint 643) which were intensely intriguing to us. They were very distinctive in appearance, having masses of tall, stiffly upright, dull green, channeled leaves ¼″ or more wide. The tall, heavy scapes had a long pedicel and large red flushed seed capsules very similar to those of *Habranthus concolor.* Dried flowers were quite large, with a short tube, long style and deeply trified stigma. The bulbs were much smaller than those of *H. concolor,* but larger than the average *Zephyranthes* and somewhat elongated.

Upon our return home, three of these bulbs were sent to Dr. Traub and, much later, two to Dr. Walter Flory and Dr. Raymond Flagg.

For several years, the bulbs languished in a location which apparently did not suit them. The survivors were eventually moved to a better spot, but never really thrived. Unlike the vigorous growth noted in the wild, the bulbs sent up a few short-lived, weak leaves which usually lay flat in the ground. To our complete amazement, heavy and prolonged rains in late May 1963 produced several buds. When open, the flowers were a large and very beautiful bright yellow *Habranthus,* different in appearance from *Habranthus concolor* or, in fact, from any other Mexican *Habranthus* we had seen. They were shaped a bit like *Zephyranthes bifolia,* but without the heavy stigma lobes of that species. Unfortunately, repeated showers prevented seed formation, although we selfed and made several crosses with other *Habranthus,* including a lovely pale yellow *Habranthus immaculatus.*

We were forced to speculate that perhaps this yellow *Habranthus* is one of the parents of *H. concolor.* Perhaps the other parent is the "large, beautiful, pure white Mayito" we were told about by a woman from Sabinas Hidalgo in May 1955. We never found this in that area, although we collected a glaucous leaved white *Habranthus* in the mountains along the Rio Verde Road.

In our many trips since 1955, No. 643 was never seen again. Since growth habit is rather striking, this poses some questions: Are they scarce and on the way out? Do they normally have a different blooming and growing season than *H. concolor?* Are they perhaps more numerous in another locality?

A few blossoms appeared on this small collection through 1965, but due to neglect during Morris' final illness, which began about that time, I am not sure there are any living bulbs left.

THE TERMS—RHIZOME AND STOLON

HAMILTON P. TRAUB

There is much confusion about the meaning of the terms, *rhizome* and *stolon.* This is due to fuzzy thinking on the part of those offering definitions of terms in botany and plant science texts, and also in general language dictionaries. Usually the definitions of the two terms are overlapping which leads to confusion. It is worth while in this connection to consider the original linguistic roots upon which the terms are based.

Rhizome, from the Greek, *rhizoma,* root. The early workers may have confused the underground stems with roots, and thus based the term on an unsound linguistic background, or they may have used the word in the sense of root-like (underground) stems. Whatever the case may be, it is safe to say that they referred to underground parts only. Thus, it is evident that they were referring to underground stems.

Definition: A rhizome is any underground stem, short or longer, rooting under natural conditions, and sending up an aerial branch or branches, and thus serving to increase the volume of the parent plant, or to reproduce a new plant or plants when severed from the parent stock. As a general statement, a rhizome is a short, or longer underground stem, capable of sprouting an aerial branch or branches under natural conditions. There are various types of rhizomes. Examples: Peruvian (Irish) potato, peony, *Hemerocallis, Canna, Alstroemeria, Allium glandulosum* Link & Otto, etc.

Stolon, from the Latin, *stolo,* shoot (= branch of a plant). Here it is plain that only above ground parts of the plant are involved.

Definition: A stolon is a short, or longer above ground (aërial) stem, usually growing near the ground, rooting at internodes and sending out a shoot or shoots under natural conditions, but also including tips of higher branches recurving, touching the ground, rooting and sending out a shoot or shoots, and thus in both cases serving to increase the volume of the parent plant, or to reproduce a new plant or plants when severed from the parent stock. There are various specialized types of the stolon. Examples: runners of crab-grass rooting at the internodes, strawberry runners, rooting of recurved black raspberry stem tips, etc.

Any intermediate examples between the rhizome and stolon should be indicated as such. For instance, the rootstock of the German *Iris* is apparently on the borderline.

Thus, there is no sense in having these two terms overlap to the confusion of the general public. It is hoped that phytologists (botanists or plants scientists), and dictionary makers will take note and avoid confusion in the future.

AMARYLLID NOTES, 1973

HAMILTON P. TRAUB

Haylockia americana (Hoffgg.) Traub, *comb. nov.*, Syn.—*Sternbergia americana* Hoffgg., Verz. Pfl. 197. 1824-26; *Haylockia pusilla* Herb. Bot. Reg. 16. pl. 1371. 1830.

Brodiaea hooveri (Niehaus) Traub, *comb. nov.* Syn.—*Brodiaea elegans* ssp. *hooveri* Niehaus, in Univ. Calif. Publ. Bot. 60: 48. 1971.

X *Crinodonna traubii* Moldk. clone 'Elizabeth Graf' (Traub, 1972); similar to clone 'Alma Moldenke' (see PLANT LIFE 17: 73-74. 1961 for description). It is a cross between *Brunsvigia* x *parkeri alba* ♀ and *Crinum moorei roseum* ♂. The umbel is up to 18-flowered; flowers almost white, with only a very slight pinkish tinge in upper part of segs; turning very light pinkish on ageing. Delightfully fragrant. Autumn-flowering.

AMARYLLIS AND OTHER AMARYLLIDS

ALEK KORSAKOFF

AMARYLLIS

Amaryllis clone 'Flores Foster'. In June 1968 my wife's friend, Mrs. Flores Foster, 1921 Silva St., Long Beach, Calif. sent seeds of her cross between *Amaryllis* clone 'Star of Bethlehem' and *A. petiolata* (syn.—A. argilagae). In April 1972 a neckless bulb, 4.5 cm. in diam., with gray tunics, growing in a 4-inch pot, bearing two keeled leaves 40 cm. long, 3 cm. wide, produced a two-flowered scape. The strikingly brilliant Indian Orange (HCC-713/1) colored flowers are 9 cm. across, 12 cm. long.

Tepaltube is 2 cm. long, segs 8.5 cm. long, 2, 3, 3.7 and 4.5 cm. wide. Stamens of four sets of lengths; style as long as the shorter stamens. Flower dark green in star shaped center to almost white, ending 4 cm. from the tips of the segs. Style greenish, stamen-filaments Indian Orange tinged at the stigma, and anther ends. Trilobate stigma pink; anthers yellow.

Spathe-valves 5.5 cm. long, 0.7 cm. wide, dry at anthesis; Ovary 1 cm. long; pedicels 4 cm. long, green; peduncle 43 cm. long, pinkish near the bulb; slightly compressed, 1.2 cm. diam. near the bulb, narrowing to 0.8 cm. near the umbel.

Named in honor of the Amaryllis fancier who made the cross.

Amaryllis clone 'Krasotka'. In Dec. of 1967, *Amaryllis reticulata* (emasculated) was pollinated with pollen from *A.* clone 'Mrs. Garfield'. The backcross was successful, producing a few seeds, which were planted. In March 1972, the seedlings started blooming.

One of them, with flowers described below, I consider worth keeping, and it is named as indicated above. It flowered in a 4-inch pot, the bulbs are less than 3.5 cm in diam., tunics light brown, almost neckless, carrying four dark green leaves, with lighter green striations in the middle, about 30 cm. long, 2 cm. wide. Umbel 3-flowered, scape cylindrical, glaucous, 34 cm. long, 1 cm. in diam. narrowing to 0.5 below the spathe valves which are 4 cm. long, 1 cm. wide, soon drying. Pedicels round, 3 cm. long; ovary dark green, 1 cm. long.

Tepaltube greenish on the outside, 3 cm. long; tepalsegs 8 cm. long, 2-3-4 cm. wide. At anthesis, the perigone flattens to 11 cm. across, with segs slightly crinkled at the edges in the upper ⅓; top seg and the two petsegs gracefully reflexed, lower segs are straight, tips recurved.

Color of the upper half of segs Azalea Pink (HCC-618) fading to 618/3 to meet the green center of the florets. Top setsegs and petsegs white, striated, 0.3 cm. wide., end about ⅓ length of the segs from the tips of the segs leaving them in solid color; lower setsegs striated, extending to the tips, the labium being only faintly lighter in the middle.

Stamen-filaments and style green in the tepaltube, whitish in the middle and 618/2 in the upper ⅓. Anthers gray; stigma trilobed, white.

ZEPHYRANTHES HYBRID

Zephyranthes x *nicetria* clone 'Meta Korsakoff'. Another interesting sibling of *Z* x *Nicetria* bloomed, and we (wife and I) decided it is good enough to be named.

My wife called it ''loose-petaled but beautiful''. It is not overlapping and the segments of the perigone curl like blades of a propeller; all of them are of about the same width. It will carry the name of my wife, who was very much impressed by its beauty.

Flower's basic color is Cyclamen Purple 30/3 (R.H.S. Chart), Segments have white keels outside and white strias in the middle of about 2/3 of the lower part. Outer segs are white, clawed at the tips. Floret is ca. 8.5 cm. in diameter. Segments are ca. 6 cm. long and ca. 2 cm wide. Deep in the center there is a very light green spot.

Straight, centrally poised style; filaments of the stamens and the trifid, thickish forked stigma are white. Anthers are orange-yellow. Ca. 2.5 cm. long tepaltube is very light green. Ca. 0.5 cm. ovary is darker green than the tepaltube, and ca. 4.5 cm. long pedicel is incased in ca. 3 cm. long spathe. Peduncle is ca. 45 cm. long.

No foliage is present at anthesis.

HABRANTHUS VARIANT

Habranthus robustus clone 'Meta Korsakoff'. For about 15 years, since Mrs. Morris Clint of Brownsville, Texas, sent me a number of Rain Lilies, I am involved with these admirable little things. Watching them, I came to the conclusion that in *Zephyranthes, Z. atamasco* and in Habranthus, *H. robustus* are the most variable—the first in form only; the second in coloration as well. One morning this summer (1972), glancing toward the oak tree where my Rain Lilies are, I was startled by the sight of an unusual white flower. On closer examination it proved to be *H. robustus* variant, even lighter than the tint of Veronica Violet 639/3 (HCC Chart).

Clone's ca. 3.5 cm. in diameter bulb carries at anthesis two regularly dusky leaves ca. 30 cm. long as measured from the neck ca. 5 cm. long. Leaves are ca. 1.3 cm. wide. Both bulb and neck are covered with black tunics.

Ca. 40 cm. high scape has light green peduncle ca. 26.5 cm. long. Ca. 5 cm. long spathe of the same color as peduncle and the ca. 4.5 cm. long pedicel has dark green tips. Ovary is also dark green.

Perigone segments are a good ca. 7.3 cm. long, vividly light green outside in the lower ⅓. Within floret they are almost white in the middle, darkening to *almost* the shade of Veronica Violet 639/3 at tips. Outer top seg. is ca. 3 cm. wide; lower two ca. 2.2 cm. Inner two segs. are ca. 2 cm. wide and the labium is ca. 1.5 cm.

Style greenish at attachment and white in the upper part is surmounted with curling forks of the also white trifid stigma. Dark egg yellow anthers add contrast to the greenish center of the almost vertically pointing floret.

The name given to this lovely clone is that of my wife, who has Habranthi popping up all over the yard.

NEW SYDNEYAS

X *Sydneya easterlyi* R. E. Manning. These robust growing bright Rain Lilies will be a valuable addition to any Rain Lily nut collection.

The bulb covered with dark reddish brown tunics, ca. 4.5 cm. in diameter and ca. 5.5 cm. long, has ca. 7 cm. long neck.

Two leaves ca. 1.5 cm. wide produced from the neck and two flower scapes coming from the bulb on sides of the neck are ca. 55 cm. long measured (both) from the soil.

Florets favoring seed parent more than pollen parent open to ca. 10 cm. across and pleasingly colored Rose Purple 533/1 (HCC Chart) at the tips, fade to 533/3 and finally blend into the light green centers. Perigone segments are ca. 8 cm. long, outer top segment is ca. 2.7 cm. wide and lower two ca. 2.3 cm. Inner segments are ca. 2.2 cm. and the lobellum ca. 1.7 cm. wide.

Style bearing straight forked stigma is ca. 5.5 cm. long. Stamens are of two lengths—ca. 4 cm. and ca. 2 cm. Anthers are yellow.

Florets and very dark green ovary of ca. 1.2 cm. length are subtended by light green ca. 6.5 cm. long pedicels enclosed in greenish white spathe ca. 4 cm. long with dark green valve tips. Peduncle, ca. 40 cm. long, is in color lighter green than the leaves.

The description given is of the first flowering of a seedling from seed received from my friend Russell E. Manning, 717 Valley Avenue, Spring Valley, Minn. 55975, and duly bedded in August of 1969.

The name Easterly is according to the legend received with the seed: X *Sydneya* x *easterlyi* R. E. Manning, a cross of *Habranthus robustus* x *Zephyranthes grandiflora.* Should give a smoother pink color and larger size.

X *Sydneya easterlyi* clone 'Russell Manning'. My good friend who was generous to send me seeds of his cross, proved by this clone to be superb, deserves to have the clone named in his honor.

Leafless at anthesis, bulb covered by dark reddish brown tunics, ca. 4 cm. in diameter with a neck ca. 4 cm. long, have two scapes. Peduncles ca. 30 cm. high were topped by ca. 7 cm. long pedicels enclosed in a Rose Purple 533/2 spathe tube with ca. 5 cm. long valves.

Pedicels bear ca. 1 cm. long ovary surmounted by exquisitely formed floret with well overlapping segments ca. 10 cm. long and flaring ca. 13 cm. across and ca. 14 cm. vertically. The predominant color of florets is Rose Purple 533/1 fading to almost white towards the center and there blending into the light green.

Outer segments measure ca. 3.5 cm. in width, inner ca. 3 cm. Style with trified stigma overtops different in length stamens by ca. 1.5 cm. Pollen is yellow.

Will I ever see another Rain Lily of this size and form in addition to a very pleasing color? I doubt it.

CYRTANTHUS

Cyrtanthus clone 'Clarence Lantis' (A. Korsakoff). Another one of the batch of bulbs sent to me by Mr. Clarence Lantis, Bethel, Delaware, 19931, is in flower. Burnt Orange 014/1 (R. H. S. Chart) is the color of the florets, flaring to ca. 8 cm. across. The parentage of this clone again is unknown.

The ca. 3.5 cm. in diameter bulb, with ca. 5 cm. long neck, bears ca. 37 cm. long, light grayish green leaves, ca. 1.5 cm. wide. Scape is ca. 32 cm. high; spathe valves ca. 7.5 cm. and pedicels ca. 4.5 cm.

long cap the ca. 20 cm. long peduncle; ca. 1.5 cm. long ovaries support the ca. 10 cm. long florets.

My friend who is so generous with his bulbs and very often seeds, has to be and is honored and, I hope, sufficiently repaid for all the things he sent me, by the publication of the description and naming of this attractive plant in his honor,—*'Clarence Lantis'*, a clone that is enhancing my collection of *Cyrtanthus*.

REGISTRATION OF NEW AMARYLLID CLONES

MR. W. D. MORTON, JR., *Emeritus Registrar*

____________, *Registrar*

MR. CHARLES HARDMAN, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an international basis. The procedure is in harmony with the International Code of Botanical Nomemclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. 92037. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62, 1960; Addendum. PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis**, at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on, should be addressed to Dr. Hamilton P. Traub, Editor, 2678 Prestwick Court, La Jolla, Calif. 92037. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1972

Registered by Mrs. Russell Whipp, 530 Red Cliff, San Antonio, Tex. 78216.

Amaryllis clone **'Cream Puff'** (Whipp, 1972) R; A-991; D-5b; U—3-fld; 22½" h; fl. 4" long; 5¾" across face; spr.; creamy white, underlaid with green, faint red stripes in upper pqrt. 'White Giant' parentage, in 6th generation.

Registered by Mrs. Dorothy J. Ettensperger, 438 Jeffries, Monrovia, Calif. 91016.

Amaryllis clone **'Mary's Pride'** (Ettensperger, 1972) R; A-992; D-5a; U—4-fld; 26″ h; 9—11″ in diam. dark bronzy red.

Registered by Mrs. Sam Forbert, 1910 Evergreen Lane, Hattiesburg, Miss. 39401.

Amaryllis clone **'Sam Forbert'** (Forbert, 1972), R; A-993; D-5a; U—4-fld; 23″ h; 3″ long, 9″ across face. Flower color orange red (Hort. Colour Chart).

Registered by Mrs. Frank J. Pahls, 3035 S. W. 15th St., Miami, Fla. 33145.

Amaryllis clone **'Alek Korsakoff'** (Pahls, 1972) R; A-994; D-4b; U—3-fld; 47″ h; Spr.; 2½″ long, 7½″ across face; flowers light green with roseate blush suffusions, streaked and spotted like **A. pardina.** Parentage: **A. pardina** ♀ x **A. evansiae** ♂.

Registered by Alek Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208.

Amaryllis clone **'Lydia Pahls'** (Korsakoff, 1972) R; A-995; D-3; 13″ h; U—2-fld; Spr.; Els. 5″ long, 4″ across face; fls. pastel peach to lightest greens. Parentage: **A. belladonna** ♀ x **A. evansiae** ♂.

Amaryllis clone **'Teddie Buhler'** (Korsakoff, 1972) R; A-996; D-3; 9½″ h; U—2-fld; Spr.; fls. 3½″ long, 3″ across face; flowers yellow ochre. Parentage: **A. starkii** ♀ x **A. evansiae flavescens** ♂.

Amaryllis clone **'Miami Scarlet'** (Korsakoff, 1972) R; A-667; D-3; Fls. carrot red, 4″ long, 3¼″ across face. Parentage: **A. belladonna** ♀ x **A. evansiae flavensens** ♂.

Amaryllis clone **'Frieda'** (Korsakoff, 1972) R; A-997; D-3; Spr.; fls. 4½″ long, 4″ across face; fls. shrimp red shading to poppy red, and melting into the green central star. Parentage: **A. belladonna** ♀ x **A. evansiae flavescens** ♂.

PLANT LIFE LIBRARY—continued from page 148.

caring for shrubs; (3) six ways to multiply your plants, and (4) an illustrated encyclopedia of flowering shrubs. Highly recommended.

10. TREES. 1972. Pp. 160. Illus. $6.95. 1972. The subject matter is grouped under the following headings: (1) the right tree in the right place; (2) choosing, buying and planting; (3) feeding, pruning and spraying; (4) expert tips from professionals, and (5) an illustrated encyclopedia of deciduous trees. Highly recommended.

11. EVERGREENS. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under the following headings: (1) an evergreen for every use; (2) the first steps: choosing and planting; (3) caring for conifers; (4) growing, the broad-leaved species; and (5) an illustrated encyclopedia for evergreens. Highly recommended.

HEALTH OF THE NATION CONFERENCE PROCEEDINGS, March 21—Apr. 8, 1971. This report appears in a special issue of the journal, "Hamdard", published by the Institute of Health and Tibbi (Medical) Research, Pakistan, under auspices of the Hamdard National Foundation, Pakistan. Edited by Hakin Mohammed Said. Pp. 505. Illus. $26.50. Part I is concerned with general papers on national health. In Part II appear reports on health services in the various States from Austria to Viet-Nam. In Part III appear special reports on environmental pollution, drug addiction, tobacco smoking, etc. Recommended to all interested in national health, environmental pollution, drug addiction, etc.

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3. GENETICS AND BREEDING

HYBRID AMARYLLIS: TO BREED IN, OR OUT, OR BOTH?

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The writer wishes to suggest a general approach to amateur (and professional) amaryllis breeding that seems much more effective and satisfying than the methods commonly used. Of course if you like to gamble against great odds for the elegant exception, or if you can raise 25,000 seedlings every year for 50 years, I do not resent your fun. Seriously, I have no argument with the plant raiser who has no objective except to observe the infinitely variable and sometimes beautiful combination of random genetic factors. Also, it is not sensible to expect many of us to acquire the very scientific methods of the geneticists who are now creating superior strains of rice, but perhaps a little method in our madness will be satisfying.

According to my informants in Holland, the splendid Dutch Amaryllis hybrids have been produced almost exclusively by crossing superior clones without much regard to ancestry and any previous inbreeding. My informants, who are qualified geneticists, do not believe that promiscuous out-crossing is the most effective way to produce uniform, vigorous seedlings. They believe instead, that the superior individual Dutch clones result from fantastically large populations and the laws of probability. I argue that, in addition, the Dutch have practiced a slow, gradual form of inbreeding in spite of their intentions.

For convenience, one can list three methods for the production of superior plants of agricultural importance, as follows:

1. *The selection and propagation of the best seedlings of random crosses.* Whether this method is practiced by nature or intelligent man, it is interesting to note that usually the plant population gradually becomes more inbred. In an isolated region, the random crossing *eventually* produces distinct species, but many, many generations of seedlings are required.
2. *Continued inbreeding for uniformity and the selection of the best mutations.* The marglobe tomato is a result of this method. There are superior highly-inbred strains of peas, petunias, dogs, mice, and many other species in many genera.
3. *The crossing of highly inbred strains having carefully selected characters.* This cross produces the F:1 hybrid with great vigor and reproductible characteristics. Nearly all of the commercially grown corn in the United States is produced by this method, and the use of F:1 hybrid flower seeds and vegetable seeds has increased enormously during the past 20 years.

What does all this discussion mean for you? You, trying to create new forms of *Amaryllis?*

If you can grow 20,000 *Amaryllis* seedlings every year, and especially if you can persuade your grandchildren to carry on your work, method 1 is feasible. However, I think it is *not* the most efficient method, even for the large grower.

If you already have your desired plant form, continued inbreeding may preserve and gradually improve it. You may find sterility problems, especially if you try to inbreed very closely by selfing particular plants, but a uniform strain of *A. belladonna,* for instance, can be carried on forever by breeding only within the species.

I have proposed the third method, and plant breeders in other genera generally approve. Traub suggested the feasibility in his Amaryllis Handbook. The results of my own breeding are very encouraging, even with relatively small populations.

Let us suppose that you wish to develop a large, evenly spotted, wide-open long-lasting flower that blooms on a vigorous plant in 18 months from seed. You can cross all flowers with any dots on them and wait a lifetime for failure or accidental success, or you can carefully inbreed first and wait only part of a lifetime. Consider the practical problem: pretend that each of the following characters is determined by one dominant gene in the chromosomes:

1. Large flower
2. Evenly spotted
3. Wide-open
4. Long-lasting
5. Early blooming
6. Vigor

If you could find six bulbs, each containing a pair of one kind of the above genes, you would probably have to grow at least 1059 seedlings over a period of ten years to obtain all six characters in one plant. Since you would grow a dozen or so seedlings of each cross, the total seedling count would be well over 10,000.

The above example is an imaginary one that never occurs in *Amaryllis.* It appears that any one character is usually determined by a specific combination of many genes, some dominant, some recessive, and some intermediates. And the probability of getting a number of desired genes (say 10) transferred from a parent bulb to a seedling depends drastically upon whether the parent is homozygous or heterozygous for each particular gene or trait. To explain: if the trait, *pure white,* can be determined by the right combination of perfect *twin* pairs of certain genes, then a plant containing such twin pairs is said to be homozygous for that trait. More likely, a certain trait depends upon having gene pairs that have dissimilar genes in some individual pairs. Now, even if the desired trait is uniquely determined by the existing combination of genes, there is no possibility whatever of transmitting the trait to a different plant type by simply crossing and selecting, and then crossing the siblings forever. That is, if the genes *a* and *b* must be paired to yield ''pure white'', one obviously cannot introduce the trait into another strain in one generation by crossing *a:b* on a plant with genes *c:d* in the corresponding chromosome position—one can get only *a:c, a:d, b:c, and b:d.*

How often we see a beautiful big red Amaryllis and say, "I must cross many things on that plant!" Very sad. If the big red is a product of much random crossing, the chance of transmitting its loveliness to offspring from random pollenation is negligible. After the Dutch have grown fantastic populations of more-or-less random crosses for many generations, look how much variation occurs in their seeds. Actually, their crosses have not been random; much inbreeding has occurred, but inbreeding apparently has not been done systematically. The traits in their strains are still not homozygous.

I think the formula for efficient breeding toward desired types of plants is to inbreed for maximum homozygosity, so that gene each tends to be paired with an identical gene. Then, when you cross plants, the number of possible combinations is greatly reduced.

In addition, you get a bonus when you cross two inbred bulbs—heterosis or hybrid vigor. It is the writer's observation that even one generation of selfing in two parent bulbs gives improvement in uniformity, predictability, and vigor that is easy to see. Of course, greater inbreeding before crossing is preferable.

The crossing of any two bulbs with a family relationship produces some measure of inbreeding, but selfing a bulb upon itself is by far the best way to inbreed fast—if you are not defeated by sterility. The next best course is to cross siblings. Inbred sterility usually becomes less bothersome after much inbreeding, in my experience. My inbred red line that has been selfed for about six generations is almost completely uniform, and it imparts great hybrid vigor to other inbred lines. And yet it contains species blood.

Inbreeding is frustrating in the early stages, and sometimes new blood *must* be introduced, but when you finally have some uniform inbred strains, you can begin to predict the results of your crosses.

A final word: if you can *start* with material that is already stabilized to some extent by inbreeding, you will save much time. One such form of material is species, but you will probably not limit yourself entirely to species. You can also look for seeds and bulbs with known inbred parentage.

It should be obvious that the breeding method proposed here is useless unless you keep good records of your experiments. Also, I advocate cooperation among groups of amateurs to obtain a desired result most quickly and to ensure continuity in case one breeder drops out of the game.

BREEDING FOR YELLOW AMARYLLIS HYBRIDS

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Some people believe, that a violet should be violet and consider a white or a pink violet a freak of bad taste; a blue rose or a yellow amaryllis then would be adominable. Yet many hybridizers have tried to raise them and as long as amateurs, plant lovers and horticulturists exists, there will be the tendency to create unusual colour shades.

The writer has been experimenting for some years to obtain a large-blooming *Amaryllis* hybrid with pure yellow flowers. This colour is apparently not present in any natural *Amaryllis* species, except in a very diluted or concealed shade.

Our first trial started by crossing an orange flowering species—*A. striata* var. *crocata*—with a pure white blooming unnamed Ludwig hybrid. The idea was, to take advantage of the easy growing habit and recurrent flowering of the species, hoping to combine it with the large size and good shape of the hybrid partner. We hoped, that among the descendants might be some yellows, to be used for further improvement.

The F_1 hybrid resulting from this cross showed about uniform medium-sized flowers of various rather disappointing colours varying from pale brownish orange to a faint pastel pink, none of which had brilliancy. We therefore abandoned further experiments, as there were no prospects of yellows.

We had sent a few of our F_1 seeds to Mr. Fechner in Germany, who at that time experimented with *Amaryllis* hybridization. He selected some of his seedlings, which he believed to be the most promising and crossed them among each other. According to his report, the resulting F_2 generation showed surprisiingly all white flowers.

The writer fails to find a plausible explication for this; the white colour in flowers is really due to lack of colouring matter in the flower. White blooming plants lack the capacity of producing pigment, but when they are hybridized with another plant having this capacity, the offspring ordinarily should show only coloured flowers. Geneticists consider therefore the white blooming character as recessive, because it tends to disappear in progeny, except in pure lines.

Readers interested in studying this matter, should read the book ''Experiments in Genetics'' by prof. C. C. Hurst, edited in Cambridge, England, 1925, which contains several long chapters dealing on genetics of albino (white) orchids, which are applicable on *Amaryllis* breeding.

Mr. Fechner decided to pollinate a few of the best of these white blooming plants mutually, creating thus the F_3 generation. When these seedlings flowered, all were again white, except one plant, that had nice, pale orange flowers. The grower named this 'Blossfeld's Orange' but apparently, did not register this name. Discontinuing his hybridizing with *Amaryllis,* he sent a few seeds, obtained by self-pollination of this plant, back to the writer.

From the seed received, we raised a few plants of this ''Blossfeld's Orange'' hybrid and found that its flowers, though not so large as many new hybrids, had an acceptable size and shape. The colour of the flower is basically a cream white, being so densely criss-crossed by a tiny and narrow network of orange reticulation, that the general appearance of colour is a yellowish orange.

A couple of years ago, we crossed this hybrid on *Amaryllis Blossfeldiae,* a brilliant orange blooming species then just discovered. Our seedlings are not yet in flower, but as we shared some seed with several American friends, there may be some plants available in the United States, when this article appears in print.

Though possibly new shades of orange hybrids may result from this cross, the writer believes that this breeding program offers little promise to produce a good, pure yellow blooming hybrid. Because of the different basic nature of yellow pigment in most flowers, which is distinct from colours derived from red, crimson, violet and rose, there is little chance to obtain a pure yellow *Amaryllis* in any breeding program involving species or hybrids bearing any of the mentioned colours.

A fresh start should be made by using some of the ''trumpet'' Amaryllis species, which have greenish-white or greenish yellow, or even pure green flowers. These include: *A. immaculata—A. elegans* and *A. viridiflora.* Special attention is called to the fact, that there have been found in nature varieties of *A. elegans* with a largely yellow perigone, showing green only at the elongated tube. The writer is presently trying to obtain bulbs or seeds of such a variety, that had been found originally by Dr. Gardner during his famous travel in Brazil, about 1837. The locality is, unfortunately, still of difficult access and it is uncertain, that we can obtain this material.

The ideal partner for hybrids from these ''trumpet'' species would be *A. aglaiae,* which is stated to have butter-yellow flowers. This, however, seems not to be a precise identification; according to the writer's observation, the flower is really milk white, having fine reticulated veinings of pink and a broad central streak of yellow on each segment, on the inner face of the perigone. Anyhow, this species is the closest approach to a yellow Amaryllis flower. An alternative would be the yellowish-green flowering *A. calyptrata.*

Among the few hybrids already existant of *A. aglaiae,* one raised by Mr. J. L. Doran using *A. evensiae,* showed a decided approach to yellow flowers. Such experiments are of course pioneer work, but they are valuable indications of the possibilities. *A evansiae* has flowers of variable colour, from green to yellow. [Editors Note.—The editor flowered one plant of *Amaryllis aglaiae;* the flowers were of a uniform very, very light yellow.]

Crosses between these various species, which are only distant relatives, may not produce seeds; or if pods form, they may abort before they get ripe. It may be necessary to repeat pollination on many different plants, before one or the other pod succeeds to full ripeness. Even if a cross fails persistently, by abortion of the immature pod, it is possible to withdraw the seeds in their embryonic stage by an aseptical operation—in the way of the caesarian operation—and sow them on a nutritional medium, where they continue to develop, until they produce roots and may then be planted out. This system is quite a normal operation with orchid seedlings, so there is a practical technique available, though a laboratory equipment is required.

It must be admitted, that this first step of the program, aiming specially a pure yellow flower, certainly will produce many unsatisfactory shades, some acceptable and very few good ones. The choice should be made regarding fine pure yellow colour as first requirement for future genetic improvement. Size and shape of flowers comes second.

After this selection has been made, a second step will be necessary, to improve size and shape. This may be done by crossing the best yellow flowers on a pure white blooming *Amaryllis* hybrid of excellent shape and size. Also for this second step, many crosses should be made, because some may fail to set seeds, others may produce undesirable progeny and only a few of the white hybrids may prove to be good breeders for this special program. There are some white *Amaryllis* hybrids on the market, that are not true albinos (though their flowers are perfectly white), and will produce reddish or crimson blooming progeny. True albinos will not introduce any other colour into the hybrid offspring, but they may cause a dilution of the yellow colour, in variable degree. Of the progeny, the less desirable must be culled out, and only those with the purest yellow colour, the largest size and best shape should be used for the third step.

This third step is finally the crossing of the various lines obtained from the different species, to combine their best selected individuals, considering improvement of other factors, beyond size, colour and shape. Such factors as position of flowers, their durability, perfume and number per stem, also season of blooming, recurrent blooming habit and easy growth should be considered. These factors may be combined by selective breeding in this last step.

As can be seen, there is a wide field of hybridizing open for those who like to do pioneer work. And after the first yellow *Amaryllis* has appeared, there will be still much improvement necessary, until these come to a quality level with the modern red, crimson and white hybrids, which too required many decades to come into being.

THE ROLE OF TRIPLOIDS IN **AMARYLLIS** HYBRIDIZATION

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Most of the large, showy *Amaryllis*, hybrids are tetraploids. Characteristics of large plant size and the heavy substance and maximum diameter of the flowers of tetraploid plants have generally been favored over those of the diploid species. Native tetraploid species such as *A. blossfeldiae* and some varieties of *A. striata* occur, but most species found in natural habitats appear to be diploid. *A. evansiae, A. starkii, A. aglaiae, A. cybister, A. belladonna* and *A. yungacensis* appear to be among the diploid species from the freely produced hybrids and the ease of making reciprocal or backcrosses. Diploid hybrids tend to maintain the smaller stature of their parentage and have led to an almost independent breeding program for *Amaryllis* miniatures. At the same time, recently discovered diploids seem to contribute a disproportionately small share to the familiar tetraploid hybrids although many distinct and desirable traits are present only in the diploids.

Triploid hybrids are readily produced by pollinating diploids with tetraploids, either species or hybrids. A modern example of triploids is found in some of the 'Senorita' hybrids when *A. evansiae* is pollinated with a tetraploid *A. striata*. Reciprocal crosses with the diploid as pollen parent are rarely successful, perhaps because of pollen-tube growth rate or a lack of endosperm development.* Triploids tend to be self and intersterile. Nevertheless, many triploids have contributed to the development of modern tetraploid hybrids. Scant but reliable seed set is often encountered when a known triploid is pollinated with a fully fertile tetraploid. It has been my experience that about ten viable seeds can be produced in a successful triploid x tetraploid cross. The resulting progeny tend to be more fertile than the triploid parent, an observation which may be explained by the fact that the most fertile progeny are usually normal or nearly normal tetraploids. This may also be the case in successful crosses using the pollen of triploids on tetraploids.

Triploids pollinated with diploids are less likely to produce viable seeds. However, I have produced through techniques of embryo culture (Bell, 1972) four plants of the cross (*A. evansiae* x tetraploid) x *evansiae.* Hybrids of triploid-diploid origin have certain interesting possibilities not found in the triploid-tetraploid combination. In the case of the *A. evansiae* backcross mentioned here, the progeny will be statistically carrying 2/3 *A. evansiae* germ plasm. In the case of the same triploid pollinated with a tetraploid, the contribution of *A. evansiae* germ plasm is reduced to 1/7.

An analysis of the chromosomal composition of diploid, triploid and tetraploid *Amaryllis* sheds some light on the role of the triploid in hybridization. Diploids contribute one set of chromosomes (11) to the progeny through each gamete; tetraploids contribute two sets (22). Triploids (33) thus receive double the chromosomal compliment from the tetraploid pollen parent than is provided by the egg of the diploid. Triploids do not have evenly paired chromosomes and in many genera are completely sterile. Fortunately, in the genus *Amaryllis*, some viable gametes are formed by many triploids, presumably through a random distribution of the third set of chromosomes. Thus, if we assume a completely random assortment after pairing of the other two sets, a gamete formed by a triploid may have anywhere from 11 to 22 chromosomes. However, it is likely that only those which are close to 11 or 22 will act as functional gametes. Chromosomal translocations, inversions or other aberrations may further reduce gamete viability in some species hybrids but are beyond the scope of this discussion. Macroscopically, triploids can tentatively be identified by the apparent paucity of pollen; microscopically, only a small percentage of pollen grains of triploid plants appear fully filled with cellular material.

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* Endosperm ploidy level would depend on the direction of a cross.

Balance among the different chromosomes in the set of 11 in the genus *Amaryllis* seems to be an important factor in determining the viability of a gamete. The fully paired chromosomes of a diploid or tetraploid are the most fertile combinations. Additions or deletions of chromosomes reduce viability. On the other hand, plants which are almost diploid may exist with an additional non-paired chromosome. In other words, the plant would have ten pairs plus one chromosome in the triploid condition and would be termed a trisomic. Trisomic plants often display unusual morphological traits; the genus *Datura* is still the best example (Avery, *et al.*, 1959). Two extra chromosomes may also exist, but that is a rarer viable combination. A tetraploid with a single extra chromosome is more nearly balanced than a diploid with the same extra chromosome. If the genetic information were equally distributed among the chromosomes, the 45th chromosome would be 1/45 of the total compliment whereas the extra chromosome of the diploid trisomic would be 1/23.

Let us make a further assumption and consider a viable gamete with 21 chromosomes produced by a triploid, one less chromosome than a gamete produced by a normal tetraploid. Combined with a gamete of a normal tetraploid, a plant would result with 43 chromosomes. Such plants exist (Traub, 1958) and this may well be one source of their origin. The plant with 43 chromosomes may be expected to breed with normal tetraploids but with a slightly reduced fertility. Selection for viable seeds favors those plants which are most fertile with the normal genetic compliment, in the case of *Amaryllis* tetraploids, 44 chromosomes. Again, there is natural selection pressure against the progeny of a triploid unless a conscious effort is made to choose the progeny on the basis of a known pedigree.

Diploid germ plasm, therefore tends to enter the makeup of tetraploid hybrids by way of triploid intermediates. And, as noted earlier, the genetic contribution of a particular diploid is rapidly diluted in as few as two generations. Thus, using conventional breeding techniques, many years and many plant generations have been required to select in tetraploid hybrids desirable traits of the diploid species. More expeditious means for producing tetraploids directly from diploids must be sought. Preliminary unpublished evidence suggests that treatment with colchicine under aseptic conditions may allow tetraploid tissue to recover from colchicine shock sufficiently that the suggested overgrowth of diploid tissue (Manning, 1969) can be circumvented.

The triploid should not be considered merely as a rarity or an intermediate in the historical development of modern tetraploid hybrids. Nor, should we be limited to the few available known triploids such as 'Senorita' hybrids. There is a distinct and positive advantage for the landscapist and amateur hobbyist in having plants which do not readily self pollinate. At the same time, such plants are not necessarily sterile mules for the serious breeder. A conscious effort must be made to identify triploids and to choose diploid-tetraploid combinations which result in desirable triploid hybrids. Careful records of successful interspecific crosses will aid in this delightful venture.

LITERATURE CITED

Avery, A. G., S. Satina and J. Rietsema. 1959. Blakeslee: The Genus Datura. The Ronald Press Co. New York.

Bell, W. D. 1972. Culture of immature *Amaryllis* embryos. Plant Life *28:* 72-76.

Manning, R. H. 1969. Amaryllis from irradiated seeds. Plant Life 25: 82-83.

Traub, H. P. 1958. The Amaryllis Manual. The Macmillan Co. New York.

AMARYLLIS BREEDING—1972 REPORT

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I am recording these notes, not because there is enough new and significant material to term it an "article", but rather in the hope this information will offer some slight help to others struggling with growing and hybridizing the *Amaryllis* species .

After at least five years of trying I am finally reaching a rather painful conclusion: namely, that it is simply not feasible to grow certain *Amaryllis* outdoors in the ground in the Baton Rouge area. By "certain" *Amaryllis* I include (1) some of the registered Dutch hybrids and (2) most of my own hybrids having *Amaryllis* species as one or both parents or grandparents. I have had a great deal of hope through the years that I would be able to grow most of my hybrids outdoors and thus retain my precious and very limited greenhouse space for the species, seed flats and a few other plants. But after this past spring and summer I have four or five moderate size beds which, at this writing in very early fall, seem to present a picture of almost ultimate desolation. We had a very hot and dry summer; not only high temperatures, but quite low humidities as well, a combination unusual for us. It was simply impossible to keep the bulbs from drying out. Not only did they make very poor leaf growth, but also lost most of their roots. Some have no roots at all and are literally laying on top of the ground. I do not mean to imply that one cannot grow some of the Leopoldii (Dutch) hybrids in this area and grow them well outdoors year around. That is, provided one has an ideal location. I have done this; so has Mr. E. M. Beckham, Mrs. T. K. McKnight, the late Prof. Claude Davis and the late Fred Buchmann. Mrs. McKnight grows literally thousands of them. But few of these are interspecies hybrids or represent an *Amaryllis* species as one parent. The great challenge for me in *Amaryllis* is to use the newest species to create new and different hybrids. So my problem is now well defined and the only answer appears to resort to pot culture, either in the greenhouse or indoors. This will certainly limit the extent to which I shall be able to pursue this activity in the future.

I do not want to imply that my *Amaryllis* picture is entirely unfavorable. Last spring I had the best greenhouse bloom I have yet experienced. Many blooms were old standbys, but there were some new things too, and I will describe a few of these.

HYBRIDS OF AMARYLLIS VIRIDIFLORA

My story of *A. viridiflora* continues to unfold. I described earlier (PLANT LIFE, 1969) how I bloomed what appeared to be an authentic but rather juvenile or stunted plant of this interesting species, froze the pollen for 10 months and then the following spring obtained seedlings from a hybrid of SA 63—20 X (*A. evansiae* x *A. aglaiae*). The SA 63—20 was originally collected for Mr. Robert Goedert and appears to be an orange-pink form of *A. belladonna.* I have about 10 seedlings from this cross and all are very slow growers except one which has made a bulb about 1½ inches in diameter. I repotted all of these bulbs this past spring and some were making a few offsets.

When I used the stored, frozen pollen of *A. viridiflora* in 1969 I used it on several different pod parents, and in some cases mixed with other pollens. One mixture was *A. viridiflora* plus *A. evansiae* on *A. evansiae* and a few seedlings were obtained. Three of these bloomed in 1972. Alhough I had not observed the foliage sufficiently well to note any differences, it soon became apparent that one bloom was distinctly different from the other two. The latter were typical *A. evansiaes.* The other plant also bloomed in mid February, one 16″ scape with two florets. But it was the form and color which were the real distinguishing features. The form of *A. evansiae* was almost completely lacking and the floral segments were more regular than *A. evansiae.* The bloom was more star shaped and the edges of the segments were distinctly and regularly ruffled or fluted. From the side the flower was definitely not *A. evansiae* in form, but neither did it have a very long tube. More trumpet shaped without too long a tube is perhaps the best description of the side view. The overall color pattern was more greenish than *A. evansiae* although the color at the outer periphery of the segments was that of *A. evansiae*. Darker green striations along the centerline of the segments also distinguishes the color pattern from that of *A. evansiae*. The stigma was capitate, minutely trilobed. I have little doubt that this is a true hybrid of *A. evansiae* X *A. viridiflora*. Unfortunately I was unable to set seed with this hybrid in 1972, either as a pod parent or a pollen parent.

I had stated (PLANT LIFE, 1972) that my unidentified *Amaryllis* species No. 1 obtained from Dr. Cardenas in 1969 might also be *A. viridiflora*. I attributed this to a very similar leaf structure showing a pronounced light green but very narrow midrib. The earlier specimen of *A. viridiflora* I also obtained from Dr. Cardenas through the late Prof. Claude Davis. Most of my seedlings from SA 63—20 X(*A. evansiae* x *A. aglaiae*) with *A. viridiflora* also show the green midrib to various extents on their leaves. Unfortunately, I shall be unable to make more observations on the unidentified species No. 1 because I lost my bulb this past summer. It had begun to make leaf growth in late spring so I decided to give it the same watering schedule (two or three times weekly) that I give all my other species and potted hybrids. When I returned home from a trip late in June there was only a hole in the potting medium where the bulb had been. This is indeed unfortunate, but certainly confirms my feelings that the culture of *A. viridiflora* is extremely difficult, if not impossible in this part of the country. I guess I should consider myself very lucky with the hybrids I have from this species. I shall try to distribute these as widely as possible as soon as sufficient stock becomes available.

STATUS OF DR. CARDENAS' UNIDENTIFIED SPECIES

It is appropriate to bring the readers up to date on the status of the unidentified *Amaryllis* species I received from Dr. Cardenas in 1969. I gave a brief status report in the 1970 PLANT LIFE and a fairly lengthy report on the three species which bloomed, including photographs, in the 1971 PLANT LIFE.

Since my unidentified species No. 1 has succumbed, we need not discuss this any more.

Unidentified species No. 2 remained dormant from the fall of 1971 through the spring of 1972 and did not bloom in 1972. It was definitely reluctant to start growing and at this writing is mixed with a large number of species and hybrids. I have not observed it for the past several months, but I think it survives and I will separate all of these into groups when it is time to put them in the greenhouse in November. Since this species appears to behave differently from the others, I have hopes it will prove to be a different or new species.

The unidentified species No. 3 bloomed in the spring of 1972 and as far as I could tell was identical with species No. 6 which also bloomed this spring as well as in the spring of 1971 (and was pictured in Figure 26, PLANT LIFE, 1972). Despite the fact that these two species appear to be identical, there were some slight differences in the bulbs. The No. 3 bulb was slightly larger and had a definitely longer neck than the No. 6 bulb (even though the No. 6 bulb was one year older). But I am willing to accept these as cultural differences or even differences in stability of the species itself. I also observed Mr. Ed Beckham's No. 3 species in bloom and I consider it identical to my No. 3 and No. 6 species. All of these I believe may well be the new species *A. neoleopoldii,* described by Dr. Cardenas and pictured in Figure 17-B, PLANT LIFE, 1972. But there are certain points of doubt in my mind. My greatest doubt is in regard to the size of the flowers and floral segments. Dr. Cardenas describes *A. neoleopoldii* as being 15—18 cm. (6-7½″) wide with upper tepalsegments 5 cm. (2″) wide and the lowest tepalseg 3.5 cm. (1½″) wide. The corresponding dimensions, in centimeters, of my 1971 bloom were 13.5-14 cm., 3.5-4.5 cm. for the upper tepalsegs and 2.8 cm. for the lowest tepalseg. My 1971 bloom was at least 20% smaller in all its dimensions. Unfortunately I did not take measurements of the 1972 blooms, but my guess is they were not appreciably larger. Such differences could conceivably result from lack of stability among separate clones of a comparatively recently originated species or might be due to simply growing the same identical species under widely different cultural conditions, e.g., in Bolivia and in Baton Rouge, La.

It is easy to conclude that my No. 6 species differs from the true *A. pardina* Hook. (Figure 17-C) and that the *Amaryllis* I pictured as *A. pardina* Hook. in Figure 26 is a descendant of the *Amaryllis* species collected by the late Prof. Ira Nelson in Bolivia in 1954 and 1958 and now considered a new species and named *A. lapacensis* by Dr. Cardenas. Does anyone have the true *A. pardina* Hook.?

I would like to raise one other question which may be pertinent. This is the possibility that some of the new *Amaryllis* species currently being named may be natural hybrids. The general similarity of some of these new species and apparent ''variability'' of others may be a clue along this line. I would like to hear some comments along these lines, particularly from those who have visited and collected and are familiar with the growing conditions there and with the possibility that natural hybridization could occur. In my own experience I am familiar with the story of our native Louisiana Irises (Series Hexagonae of Subsection Apogon). Some 70 or so ''species'' of Louisiana Irises were discovered and named by the late Dr. John K. Small of the New York Botanical Gardens in the late 1920's. Most of these ''species'' later turned out to be natural hybrids and we now recognize only four (or five) species of Louisiana Irises. This is intended in no way to diminish the contributions of Dr. Small who was really the one who put the Louisiana Irises ''on the horticultural map.'' But I am interested that a similar possibility could exist in certain areas of Bolivia or other South American countries. Presumably this would require certain insect vectors to carry the pollen at least over distances of several miles. The insect vector for the Louisiana Iris is known to be the bumblebee and these are known to be effective over areas of at least one or two miles.

Back to *Amaryllis* now, my unidentified species Nos. 4 and 5 bloomed in 1971 and are pictured in Figure 26 (PLANT LIFE, 1972). I concluded that species No. 5 was definitely *A. nelsonii,* but that No. 4 could be a different species. I understand that Dr. Cardenas considers No. 4 also to be *A. nelsonii* and therefore *A. nelsonii* must be quite variable and of comparatively recent vintage. Not only are the markings and certain other features of these two amaryllis quite different, but the growth patterns also differ to some extent. My No. 5 *(A. nelsonii)* bloomed also in 1972 after which I repotted the main bulb and three small offsets. The 1972 bloom was not quite as large and spectacular as the 1971 bloom. The No. 4 species did not bloom in 1972 and the main bulb deteriorated and eventually rotted. But three small offsets were repotted and appear to be growing well.

By far the most interesting and gratifying result I achieved in 1972 was the hybridizing success I had with *A. nelsonii* and *A. neoleopoldii* (?, species No. 6). No less than six seed pods, all having germinated to some extent, were obtained from *A. nelsonii.* The number of seedlings are quite variable but among the pod parents are such fine species as *A. belladonna, A. escobaruriae, A. starkii,* species No. 6 and possibly *A. evansiae* (I lost the label of this group of seedlings). With species No. 6 as either pod or pollen parent I have seedlings with *A. evansiae, A. starkii* and the old standby SA 63—20. It is quite fitting and encouraging that two of the *Amaryllis* species for which the late Prof. Ira Nelson was at least partially responsible for discovery have figured prominently in these hybrids.

PROGRESS IN BREEDING FOR LARGE YELLOW HYBRIDS

This section could appropriately be termed lack of progress in breeding for large yellow hybrids. There was absolutely no progress in my work along these lines in 1972, despite the fact I had several potentially promising plants bloom for the first time. Foremost were two having the parentage 'White Crane' X *A. aglaiae.* I received these from Dr. Traub several years ago. Both were beautiful amaryllis, pure white flowers, about 5 inches across with no trace of red or pink detectable. Bloom of rather small bulbs, and on short scapes (12-14″) leave no doubt in my mind that these have truly the parentage indicated. But I had absolutely no success in setting seed by selfing, sib-crossing or crossing (pod or pollen parents) with other parents representative of *(A. evansiae* x *A. aglaiae)* X white Dutch hybrids. I believe we are up against a genetic barrier here. I speculate that 'White Crane' and quite possibly most of the named white Dutch hybrids are tetraploids as are 'White Christmas' and 'Maria Goretti' (PLANT LIFE, 1971 pg. 91). Thus crossing with diploids such as *A. evansiae* and *A. aglaiae* would be difficult and success would most likely give triploids.

The triploids would tend to be sterile and this appears to be the pattern we have found. But much more effort needs to be made along these lines. The late Prof. Nelson pointed out (AMARYLLIS YEAR BOOK, 1960 pg. 97) that the progeny of his *A. evansiae* X white Dutch original crosses "were reasonably fertile and no great difficulty was encountered in obtaining seed from either self or sib pollinations." Could it be that Prof. Nelson was working with a diploid white Dutch hybrid? I believe this white Dutch *Amaryllis* still exists in the U. S. L. collection and I plan to assist in any way I can in unraveling this mystery.

ASEPTIC CULTURE OF **AMARYLLIS** OVULES AND TISSUES

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Immature *Amaryllis* embryos have been relatively easy to culture aseptically. Over 200 plants have now been produced from crosses where the capsule had begun to abort before any seeds had developed sufficiently for normal germination. In as few as 7 days after pollination, ovules in which no embryo was evident at a magnification of 40X developed on the culture medium and eventually gave rise to green, photosynthetic plants. Details for culturing immature embryos were reported in Plant Life in 1972. Under these conditions, light appeared to be a requirement, but exhaustive tests were not made on vitamin or growth-regulator additives which might overcome or diminish this requirement.

Attempts to culture ovules and immature seeds were usually made on tetraploid x diploid crosses because some of these crosses appeared successful for about 10 days or so but suddenly aborted. Successful cultures were derived from those capsules which had assumed a more vertical position after flowering. Elongation of the pedicel gave further encouragement. Preliminary tests on plants grown by this method indicate that diploid as well as triploid plants may result. Perhaps the stimulus of pollination and the cultural conditions allowed development of some embryos through parthenogenesis. Controlled, limited pollinations of tetraploid x tetraploid plants yielded capsules in which only a part of the ovules had enlarged by the stage 10 days after pollination. Neither the unenlarged ovules from the latter capsules nor the ovules from unfertilized flowers developed into plantlets in several tests.

Dry *Amaryllis* seeds were cultured aseptically with almost as much success as those removed from a surface-sterilized capsule. Treatment with hypochlorite was reduced from 5 to 2 or 3 minutes. Distribution to individual tubes or limiting the number of seeds to only a few per culture flask appeared to reduce loss since occasional seeds were apparently contaminated internally. Small seedlings grown hydroponically in vermiculite resulted in 30-50% aseptic cultures when the sterilization procedure was performed in two steps. Defoliated and de-rooted seedlings were first placed in the hypochlorite for 5 minutes. An additional cut was made at each end of the tiny bulb including one through the basal plate and the hypochlorite treatment was continued for another 2 minutes. A final equilibration with sterile distilled water was always included in the procedure.

Aseptic tissue from soil-grown bulbs presented more problems but an interesting challenge. Sterile explants were made from portions of bulb scales which did not include the basal plate but these failed to develop further although greening occurred in light. Explants of bulb scales with a portion of the basal plate were almost always overgrown within 48 hours by an organism tentatively identified as a yeast. The organism appeared somewhat rod-shaped but was clearly visible at a magnification of 100X. Re-sterilization of contaminated explants using the procedures above did not yield aseptic cultures when this organism was present.

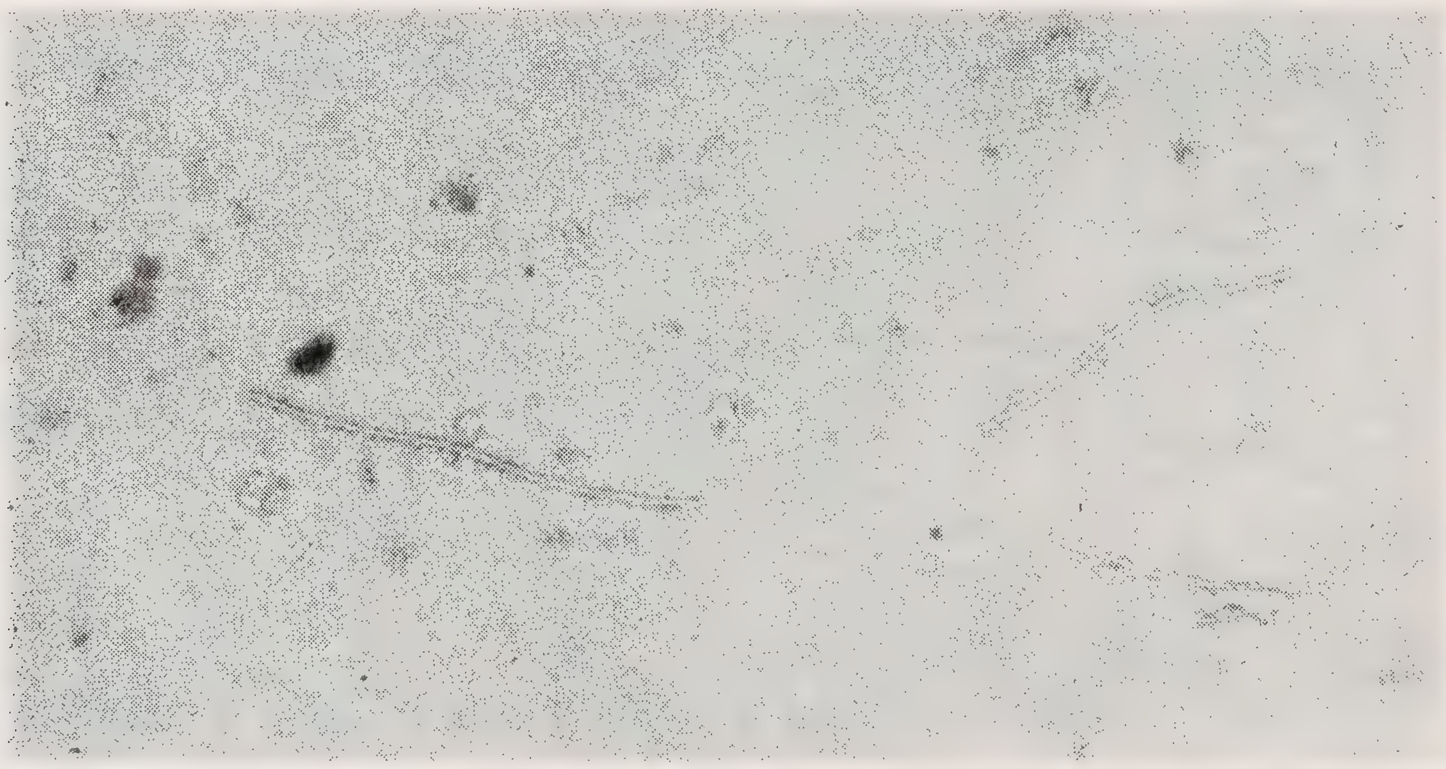

Fig. 14. Virus particles X 30,000, isolated from an infected **Amaryllis** leaf, by Dr. F. W. Zettler & Associates, Plant Virus Laboratory, University of Florida, Gainesville.

Virus symptoms or leaf mosaic on a clone of *A. belladonna* prompted further attempts to achieve aseptic cultures from soil-grown plants. The bulb was surface-sterilized and the lower half quartered. Quarters placed on the mineral-agar medium containing 2% sucrose were accompanied by a rapid growth of the yeast-like organism and one or two other contaminants. Similar quarters placed on a carbohydrate-free aseptic medium began to develop buds among the bulb scales in about 2 weeks. Such buds when excised and surface-sterilized resulted in a high percentage of aseptic plantlets on the medium containing sucrose. No buds smaller than 3 mm in length were excised but the technique could probably be improved. However, once aseptic, plantlets could be propagated vegetatively with ease and further bud development was induced. In fact, buds formed more rapidly with sucrose present after visible contaminants had been eliminated. Where bulb cuttage is not effective, this method might be considered for propagation.

Some of the aseptic plantlets grown from the plant displaying virus mosaic symptoms in the foliage do not show the mosaic in the culture vessels. However, we may not conclude that the virus has been completely eliminated. These plants will be grown to see if symptoms appear later. Another method for virus detection is that employed by Dr. F. W. Zettler of the Plant Virus Laboratory, University of Florida, Gainesville. Dr. Zettler and his associates isolated flexous-rod-shaped virus particles from infected leaves of *Amaryllis.* One of their electron photomicrographs is shown in Figure 14 with the negatively stained particles magnified 30,000X. Extracts of *Amaryllis* leaves from the initial virus-infected plant and of explants grown from buds of that plant would provide further evidence for the effectiveness of bud culture in attempts to restore an infected clone to a virus-free state.

FOOTNOTE.—Under date of Nov. 8, 1972, Dr. Bell writes that ''One of Dr. Zettler's graduate students checked out my preliminary attempts to culture meristems from virus-infected *Amaryllis* bulbs. Virus particles were found in all samples tested. Thus, this attempt has proved to be unsuccessful. However, the methods reported here seem to have merit on their own. I believe that others have already adopted the two-stage procedure for producing aseptic cultures.''

BREEDERS NEED DESCRIPTIONS OF **ALSTROEMERIA** SPECIES

HAMILTON P. TRAUB

With the renewed interest in the genus *Alstroemeria,* there is an urgent need for easy access to the descriptions of the species. Herbert (1837) recognized 29 species. In the review by Uphof (1952), he considered that Baker (1888) had critically considered the 89 recognized species included in Volume 1. 1895, Index Kewensis which is not the case. Thus, his treatment includes only 44 species recognized by Baker and published before 1888, and does not account for 45 species included in the 89 species listed in Index Kewensis (1895). Uphof (1952) also lists 18 species described from 1890 through 1915. Uphof's treatment although valuable for what it does contain is incomplete. This makes it very urgent that a lineagicist (taxonomist) undertake a complete revision of the genus *Alstroemeria* without delay, and which is to be published as soon as possible.

Species and hybrids listed in the literature since 1915 include the following:

Alstroemeria soukupii Standley ex Soukup, in Biota *1*: 126. 1955.—Peru.

A. edulis Tussac. Fl. Fl. Antill. *1*: 109. 1808.—West Indies.

A. x *raciniae* Traub, in Plant Life *8*: 85. 1952, *anglice; 28:* 67. 1972.
A. x *orpetiae* Traub, in Plant Life *28:* 67. 1972.

LITERATURE CITED

Baker, J. G. Handbook of the Amaryllideae, including the Alstroemerieae and Agaveae. London. 1888.

Index Kewensis, Vol. 1. 1895. pp. 93—94.

Herbert, William. Amaryllidaceae; and a Treatise of Cross-Bred Vegetables. London. 1837. Now available in 1970 Reprint Edition, with introduction by H. P. Traub. Verlag von Cramer, 3301 Lehre, Germany. Genus *Alstroemeria* (29 species) pp. 88—103.

Uphof, J. C. Th. A Review of the Genus *Alstroemeria.* Plant Life *8*: 36-53. 1952.

BREEDING WHITE NERINES

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Because of the dearth of white Nerines, both species and hybrids, for some years I have attempted to hybridize the few white cultivars in our collection to secure white hybrids. In the duplicate collection of the Exbury Nerines which we received from England from Mr. Edmund de Rothschild, we flowered several beautiful white hybrids as follows: *N.* 'Best White' (sometimes shows a pink suffusion), 'Snow', 'Snowflake', 'Solent Swan', 'Vestal' and 'White'. These varieties were used as seed parents which produced some white hybrids.

There are reported to be at least three white sports of Nerine species, *N. bowdenii, N. sarniensis* and *N. flexuosa.* The *N. bowdenii* var. *alba* received an Award of Merit from the Royal Horticultural Society for the Veitch Nursery on September 26, 1911. The *N. sarniensis* (white variety) was reported by Mrs. Sima Eliovson in ''South African Flowers for the Garden'' as a pure white form found on Table Mountain. Having an opportunity to consult Mrs. Eliovson at the time of her lecture at the Los Angeles State and County Arboretum, I was informed that as far as she knew this white form was no longer available in South Africa. There is reported to be a white form of *N. flexuosa,* but those I have flowered under this label were pink, but three plants of supposedly pure white *N. flexuosa* had to be destroyed before flowering, because of serious virus infection. There is a good illustration of *N. pudica* in the Botanical Magazine, t. 5901, which appears white with pink median lines.

In my Catalog of Hybrid Nerine Clones published in the Amaryllis Yearbook for 1960, there are listed three white cultivars, namely 'Candida', 'Snowdrift' and 'White Knight', the last named having pink median lines. 'Alice', the parent of 'Inchmery Kate', was said to be white with rose suffusion. After considerable research in England and elsewhere, I have been unable to trace a living specimen of 'Alice', nor any of the three aforementioned white species as well. It is interesting

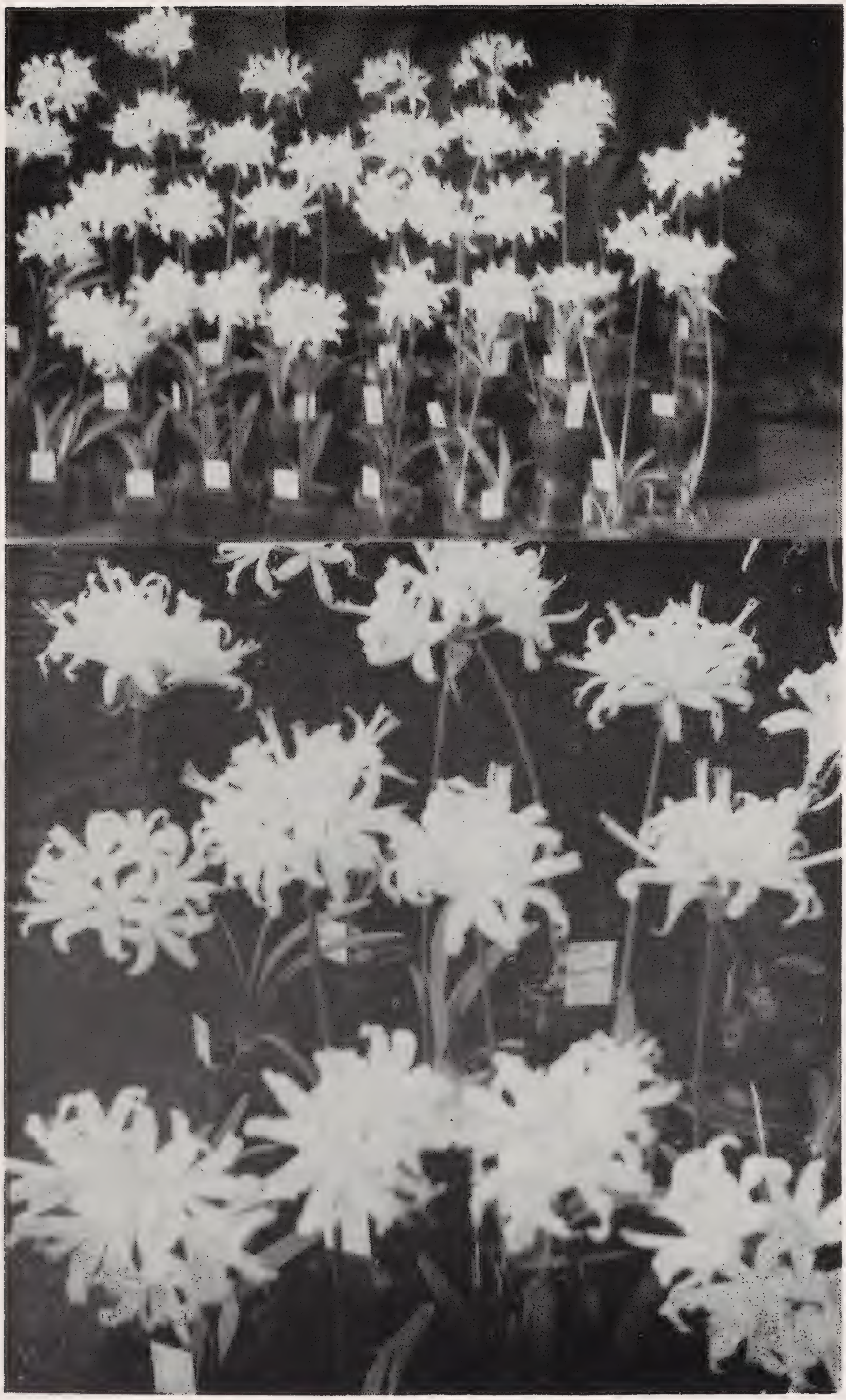

Fig. 15. Nerine hybrid clones, Greenoaks collection, 1971, Arcadia, Calif. Top, collection of white clones. Bottom, portion of above at closer range.

to speculate if some of the white hybrids have *N. pudica* in their ancestry for we have a number of white hybrids of unknown parents with pink median lines in their tepals. These latter have not been included with the white parental clones in this project.

Up to and including the fall of 1970, I had flowered twenty-four white seedlings. These were given the following epithets: 'Albion', 'Alabaster', 'Angel Wings', 'Arctic Snow', 'Carrara', 'Casablanca', 'Crystal Palace', 'Cumulus', 'Denali' (the Indian name of Mt. McKinley), 'Flying Cloud', 'Galaxy', 'Glacier', 'Iceberg', 'Innocense', 'Jack Frost', 'Milky Way', 'Sleighbells', 'Snow Maiden', 'Snow White', 'Snowbird', 'Star White', 'Taj Mahal', 'White Swan', and 'Winter's Tale'. Six new seedlings, also white, were flowered in 1971 and were given the cultivar names (with seed parent indicated): 'Halo' ('Snowflake' ♀), 'Marble Arch' ('Iceberg' ♀), 'Sierra Madre', 'Snowcap', 'Snowman', and 'Whitecap'; the four last names had 'Crystal Palace' as the seed parent. 'Crystal Palace' appears to be the most fertile of my white parents with twelve white progeny to its credit, while 'White', which sometimes shows some pink suffusion, produced ten apparently pure white progeny. So far, I have many divisions of 'Vestal' which appears very infertile having produced no white offspring among its few seedlings. As yet unflowered, there is a large progeny from the white parents. Hopefully some of these will produce white flowers. An early cultivar 'Star White' did not survive, but not before two of its progeny gave white flowers, 'Arctic Snow' and 'Carrara'.

The appearance of the few white cultivars in my collection when I first started growing Nerines, was probably the incentive for following this line of breeding. Because of the brilliance of colored Nerines—red, orange, pink, coral, fuchsia, even blue, the white flowers attracted attention by their rarity and purity. On the other hand, such is human nature, that had most of the species and hybrids been white, one would prize the few gorgeous colored ones and try to breed more of them.

After deciding on a program of breeding white nerines, the white-flowered plants were isolated as well as possible in a small greenhouse when in flower, although colored ones were blooming not very far away and no doubt bees and other insects were free to deposit pollen from them on the white flowers. From time to time when the stigmas of the white flowers appeared receptive, they were dusted with pollen from other white flowers. This rather unscientific method was necessary because of the demands of other work, several spells of illness, extensive travel and the fact that we were involved for several years because part of our land was condemned for a flood control channel and the Foothill Freeway. This required rebuilding our home and greenhouses.

In 1971 the white varieties of which there are duplicates of each cultivar, produced 44 umbels. From these a quantity of seed was harvested. A total of 28 four inch plastic community pots were sown and now in the summer of 1972, the seedlings with leaves up to seven inches high have been transplanted to three inch pots. Before the seedlings

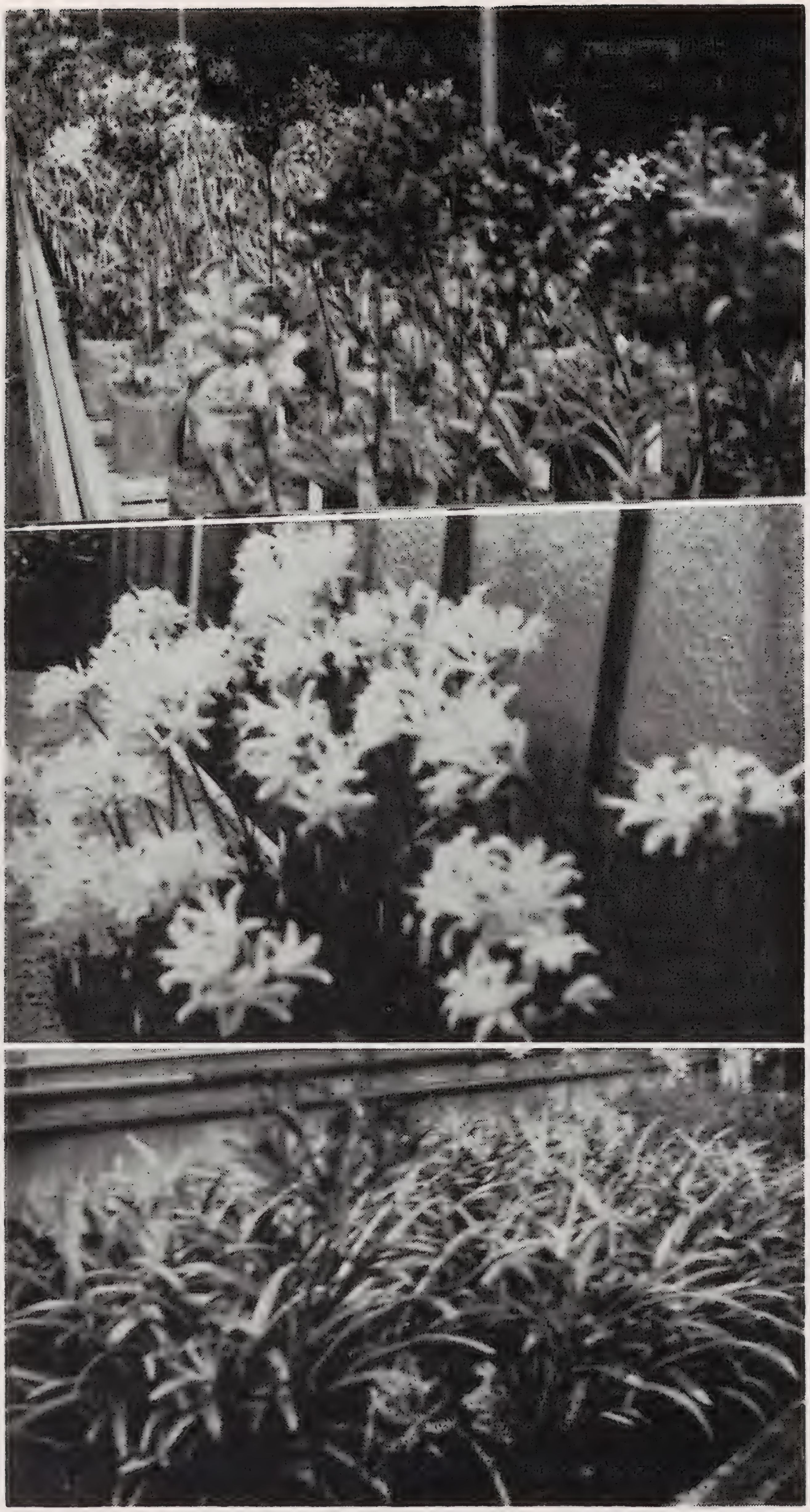

Fig. 16. Nerine hybrid clones, Greenoaks collection, Arcadia, Calif. Top, colored Nerine hybrid clones **(reproduced from color photo and rather indistinct)**; middle, collection of white Nerine hybrid clones, 1970; and bottom, **(reproduced from color photo and rather indistinct)**, tall scape in left background, clone 'Skyrocket', tall clone bred from **N. bowdenii**, 1971; and in foreground, note indistinct irregular flowers, clone 'Alma Moldenke', Dr. Traub's **N. filifolia** x 'Rosalba' hybrid.

make offsets, they must be potted to individual pots so as to keep the individual clones separate.

Owing to the number of light pinks that have flowered from the white phenotypes, I suspect that at least some white hybrids have recessive pink genes in their genotypes. After an extremely hot summer in 1971, a few apparently white clones developed a pink suffusion. Perhaps the pink genes were activated by the unusual conditions.

In 1970, an attempt to photograph the white flowers outdoors was interrupted because of sudden gusts of wind. This required that the plants be taken to the greenhouse, where because of the benches, it was not possible to get a proper camera distance. In 1971, other photographs were taken and it is hoped that these will give some idea of the collection.

A brief summary of my method of growing Nerine seedlings may be of interest. Shortly after the flower is pollinated, a capsule forms which contains a few to many succulent seeds. These are somewhat smaller than peas but generally of an oblong shape. The seeds should be harvested when the capsule shows signs of splitting, so as not to be lost or to fall and sprout on the mother plant. These bulb-like seeds are not allowed to dry and are sown as soon as possible on the surface of damp soil composed of about equal parts of sand, leaf mold and soil. They are not covered but are placed in slight depressions so as to be easily observed. After a few weeks, or even sooner, the seeds will start to germinate and thereafter grow rather slowly. A piece of glass or jar placed over the pot will help to maintain humidity. A label with the date and seed parent's name (both parents' if the complete cross is known) is made for each pot.

Although most of the mature Nerines become dormant about April or May until growth starts about September, the young seedlings remain green about two years and can be watered during the summer. Weak fertilizer may be applied during active growth. Last year at planting time the seeds were sprayed with Morsodren which seemed to do no harm and prevented all damping off. Since Morsodren is a mercury compound, it is no longer available and other products such as Consan may need to be substituted.

Seedlings flower in four to seven years. As to the hardiness of nerines, much depends on the species from which they are derived. *N. bowdenii* and its hybrids appear very hardy here in Southern California and usually, if watered are evergreen. It is believed, however, that all our species *N. filifolia* succumbed to the severe frost of December 21, 1968. The temperature was reported to have fallen under 20 degrees fahrenheit.

Some attempt was made to compare the relative quality and size of the white Nerines and 'Glacier' and 'Halo' were outstanding. During the very hot July of 1972, five Nerines flowered, two colored and three white, the latter all *N.* 'Glacier'.

This project has been a rewarding but trying experience requiring much work and permitting no time for projected chromosome counts. I am not sure that since the death of my husband who encouraged me in my horticultural work that I shall have time to continue the project of breeding white Nerines, being otherwise occupied hybridizing and growing Cymbidium orchids.

As a footnote to this article, I would like to mention two outstanding colored Nerines that flowered in the fall of 1971. One is my third-time flowering hybrid 'Skyrocket' bred from *N. bowdenii.* It is evergreen, typically *bowdenii* pink with very large flowers on a three foot tall scape. The other hybrid was produced by Dr. Hamilton P. Traub at La Jolla. It is one of the progeny resulting from crossing *N. filifolia* ♀ and various named Nerine hybrids ♂; the pollen being furnished from the Greenoaks Collection. The progeny from these crosses were named collectively *Nerine* x *traubianthe* Moldenke (see Plant Life 23: 61, and page 32, supplement, Review of the Genus Nerine, 1967). The clone shown in Fig 16 is 'Alma Moldenke'. It had deep crimson flowers on a one foot tall scape. Another, stouter similar clone is the result of crossing *N. filifolia* with the clone 'Inchmery Kate'.

Both of these colored Nerines failed to produce offsets until this year (1972) 'Skyrocket' produced one new bulblet.

Nerines are a joy because of their beauty and because they are among the few bulbous plants that flower in the fall.

BREEDING AND GROWING ALSTROEMERIAS IN EUROPE

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Although the first *Alstroemeria* species were introduced into Europe as long ago as two centuries, never have hybrids of this attractive genus been as popular as in recent years. And in fact they are becoming increasingly popular.

I. VAN HOUTTE HYBRIDS

Going back in European *Alstroemeria* history, one will find that hybrids of this genus were first raised by Louis Van Houtte of Ghent, Belgium between 1870 and 1890. He offered several named clones in his catalogs. These hybrids have now been lost as far as I know. Severe winters that we have had to face in some years kill what one collects in a life time. These hybrids have at least not been fully frost hardy. They seem, judging from old color plates, to be related to our present day *A. ligtu* hybrids. Van Houtte himself claims that they were derived from *A. chilensis* and *A. hookeri,* but which *chilensis* and which *hookeri?*—No one knows.

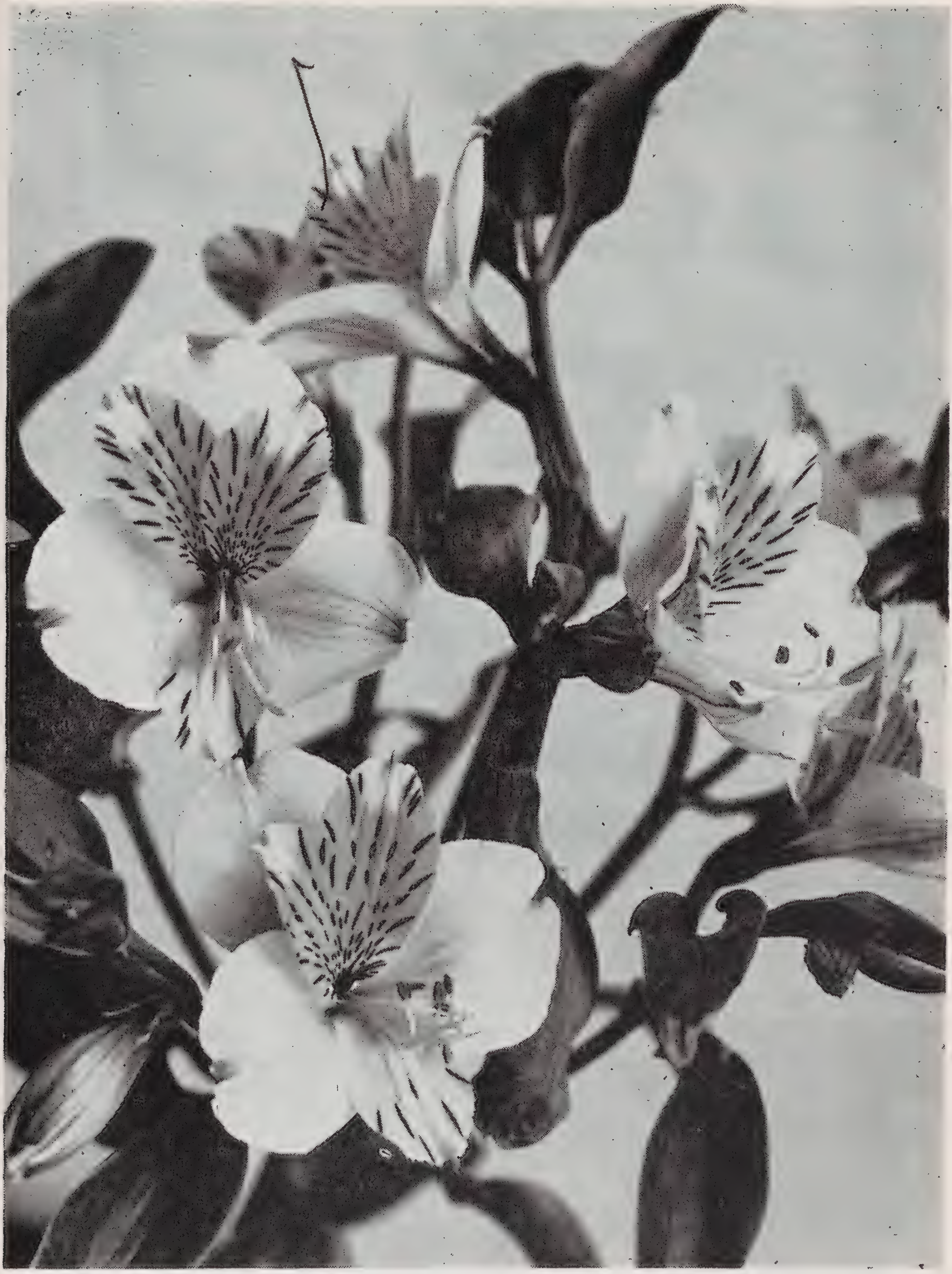

Fig. 17. **Alstroemeria** hybrid, 'Walter Fleming'; parentage: **Alstroemeria aurantiaca lutea x A. violacea.** Close up—flowers white with a bright yellow center, streaked with chocolate brown; individual florets are relatively large, up to 4½ inches (12 cm.) across.

II. RECENT ALSTROEMERIA BREEDING AND CULTURE

The start of the recent *Alstroemeria* boom was certainly due to the appearance of a hybrid derived from a cross between *A. aurantiaca lutea* and *A. violacea,* now named for the raiser, 'Walter Fleming' (Figure 17). Although obtained during the 1930's, it was not until the 1950's that a Dutchman, Mr. Jan Jan Goemans discovered the hybrid at Borde Hill, the English Estate where the hybrid originated. Mr. Goemans purchased the stock from the owner, Sir Ralph Clarke, and started growing cut flowers under glass from it on a wholesale basis in his English nursery.

The hybrid clone, 'Walter Fleming', turned out to be a heavy cropper for most of the year, giving an endless supply of long lasting, long-stemmed flowers. The individual florets are big, measuring up to 4½″ (12 cm.) across. The flowers are white with a bright yellow center streaked with chocolate brown. There are faint lilac shadings at the back of the petal tips. If cut in the bud stage, the umbels will fully develop, and it may take as long as three weeks before the last petals are shed. The cut flowers are easily packed and transported over long distances.

Breeding attempts have failed with 'Walter Fleming' because of sterility. Mr. Goemans, who is interested in increasing the color variety in such hybrids, utilized species. Within an unusually short time, he succeeded in raising an almost endless range of quality, color and vigor in his new hybrid clones. However, all are sterile. It seems that Mr. Goemans has made these various successful crosses, giving a truly pleasing variety of colors, and certainly, apart from 'Walter Fleming' and the 'Walter Fleming' mutants, which are undoubtedly the best of all, these Goemans hybrids are still without rivals.

The public was so much in favor of these attractive newcomers that the flowers brought high prices and other growers started breeding projects; research institutes began breeding operations, and amateurs started breeding them. All without significant results, although some have been working day and night on this problem for a dozen years, including the best breeders in the country and with the help of all the modern techniques. Indeed, this is a most mysterious subject in my opinion, one man doing in just a few years what many others cannot do in over ten years with apparently the same material.

But at least something has been achieved—several mutations through the application of radiation. Some of these 'Walter Fleming' sports have now been named: 'White Wings', which is purer white and less yellow, with the same dark markings; 'Yellow Tiger', which is pale yellow, with a deeper yellow center and purplish brown markings in the center. 'Canaria', which is a bit deeper yellow than the preceding. Other sports include very large-flowered clones, purplish-pink ones, and mutants with exceptionally long-flowered spikes. These others are yet to be named.

Another fine and promising new selection is an exceptionally large-flowered form of *Alstroemeria aurantiaca aurea.* This form flowers well all through the winter, while in most years 'Walter Fleming' has difficulties due to the lack of light. This new form was selected from material (that probably originated in New Zealand) by the new Chairman

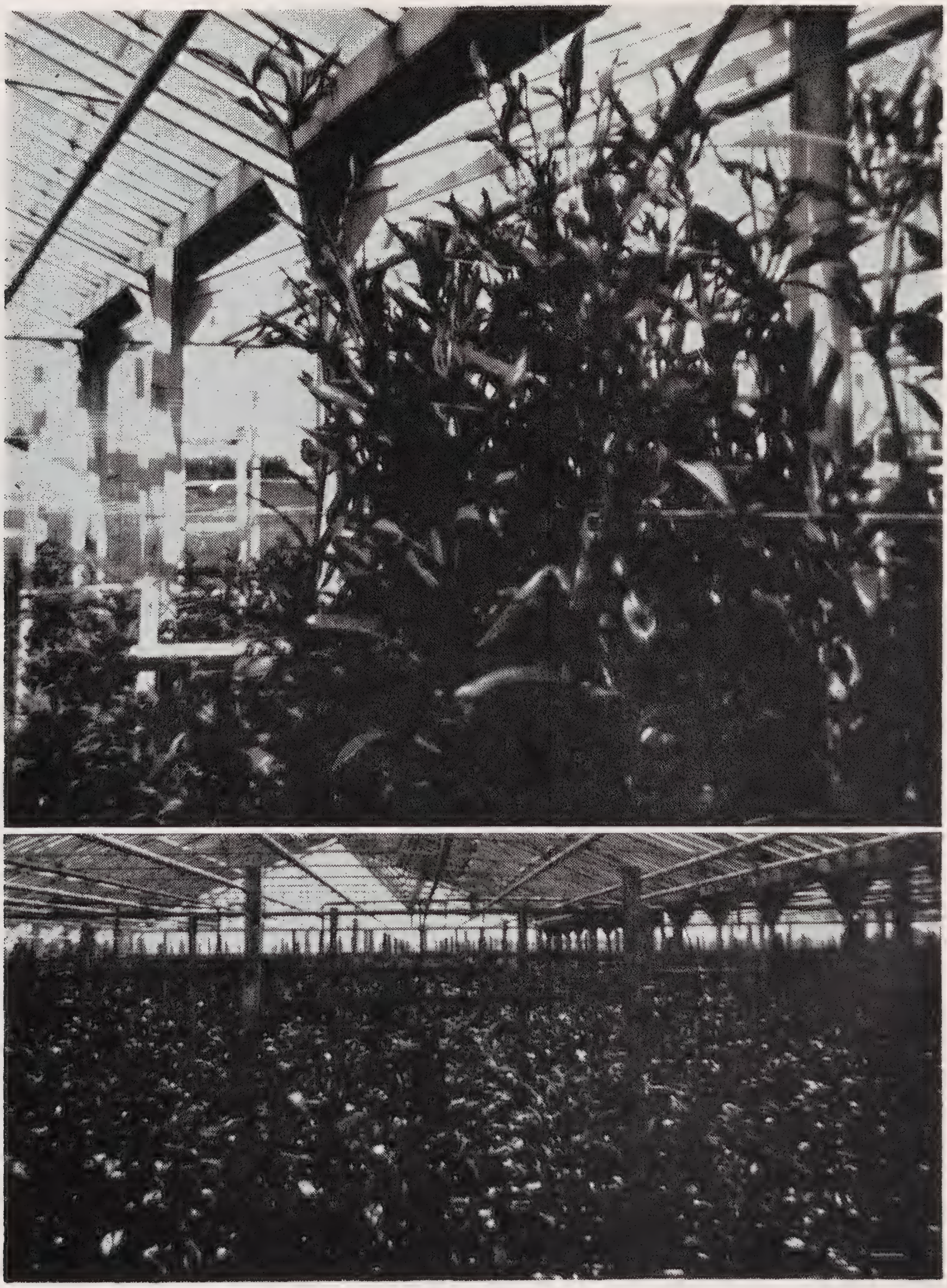

Fig. 18. Holland **Alstroemeria** cut flower industry. UPPER: a perpetual growing mutant of **Alstroemeria** hybrid 'Walter Fleming' caused by the application of radiation. LOWER: Greenhouse with **Alstroemeria,** clone 'Walter Fleming' for cut flower production.

of the ALSTROEMERID COMMITTEE, Mr. A. M. Koenst of Nieuwveen, Netherlands.

Other breeders in Holland include Mr. Van Der Zwet and Mr. Van Staaveren, and also several Government researchers who now, but so far in vain, concentrate on the development of good new *Alstroemeria* hybrids suitable for the year-round production of cut flowers under glass.

It is merely a guess, but I believe it is not far from the truth,

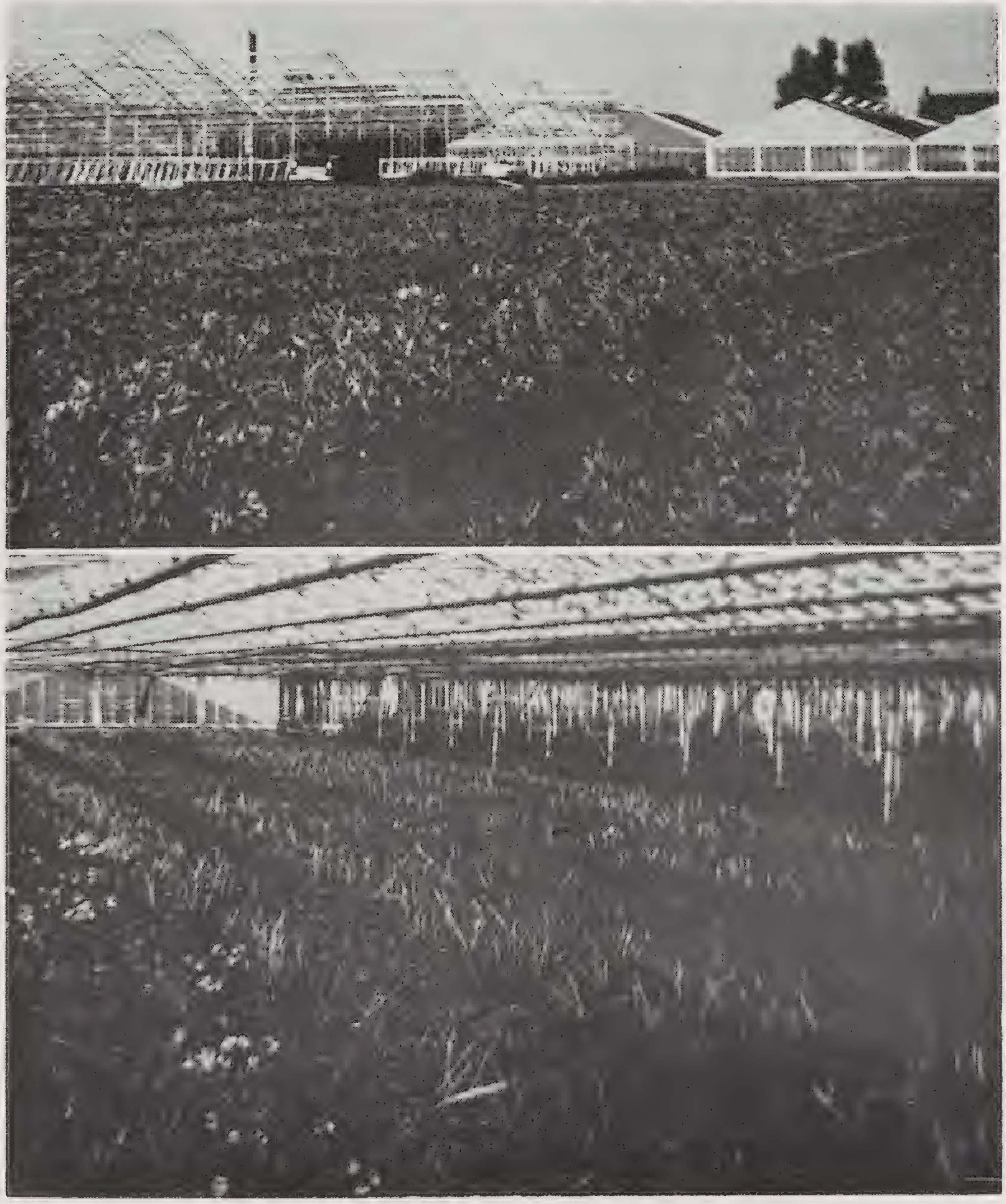

Fig. 19. Holland **Alstroemeria** cut flower industry. UPPER: **in background,** new greenhouse under construction for **Alstroemeria** cut flower production; **in foreground,** field of young stock of hybrid clone 'Walter Fleming' for propagation.

LOWER: greenhouse propagation stock of 'Walter Fleming' ready for planting out for greenhouse cut flowers.

that there are now some 75 acres of heated greenhouses in Europe planted to new *Alstromeria* hybrids, of which at least 60% are planted to 'Walter Fleming'.

It is understandable, that with the new plant breeding methods now coming into force, *Alstromeria* breeding is bound to become even more wide-spread, especially on the Continent, in the years to come.

Here we come to one of the major problems with *Alstroemeria* breeding which is the nomenclature of the species. This is, at least so on the Continent of Europe, where knowledge seems to be lacking. Thus, no one knows exactly what species he is using in making crosses, or which species are now available.

In order to open up new avenues for breeding, there is urgent need to import new species from the wild. In this respect, I have been able with the help of the American Plant Life Society to obtain several fine contacts in South America. And I myself will be making a collecting trip for Alstroemerias in Chile and Argentina during October 1972 in company with Dr. Ruppel. I anticipate that we will fine several interesting species, mostly introduced into cultivation previously but now lost in culture.

It is hoped that the present European interest in Alstroemerias will before long also spread throughout the United States where before the First World War there had been a revival of interest in commercial growing and cultivation by commercial growers and amateurs.

I cordially invite anyone interested in Alstroemerias to contact me. I am quite interested in exchanging material, experiences and information.

III. ALSTROEMERIA SPECIES CULTIVATED IN EUROPE

1. *A. aurantiaca* D. Don
   A. aurantiaca aurea
   A. aurantiaca 'Dover Orange'
   A. aurantiaca lutea
   A. aurantiaca 'Magestica Lutea'
   A. aurantiaca 'Moerheims Orange'
   A. aruantiaca 'Orange King'
   A. aurantiaca splendens
2. *A. braziliensis* spreng.
3. *A. chilensis* Lem.
4. *A. hookeri* Lodd.
5. *A. ligtu* L.
6. *A. nana* A. B. Rendle
7. *A. pelegrina* L.
   A. pelegrina alba
8. *A. psittacina* Lehm. (syn. of *A. pulchella* L. f.) ?
9. *A. pulchella* L. f.
10. *A. pygmaea* Herb.
11. *A. revoluta* Ruiz et Pavon
12. *A. violacea* R. A. Phil.

IV. ALSTROEMERIA HYBRIDS CULTIVATED IN EUROPE

'Beauty' (Van Staaveren) Apparently a hybrid between *A. braziliensis* and *A. violacea.* Height 3 to 5 feet. Flowering March-June and again September-October. The flowers are lilac in colour spotted with deep purple.

'Canaria' (Van Staaveren-Könst) A mutation caused by radiation of 'Walter Fleming'. Height 5 to 6 feet. Flowering March-June and

September-October. The flowers are soft yellow, with deeper centre and dark stripes.

'Harmony' (Van Staaveren) This lilac-flowered hybrid is of the same origin as 'Beauty', and not so tall. The height from 2 to 3 feet. Flowering from March until June and from September until late October.

A. x orpetiae (Traub) The seedlings are small at the time of writing this. Flowering is not anticipated until next year. I have not heard of the experiences of others in Europe with this hybrid. These are segregates from the original cross.

'Regina' (Van Staaveren) Seems to be a hybrid between *A. pelegrina* and *A. braziliensis.* The flowers are of a fine pink, with yellow blotches at the centre and with narrow chocolate brown stripes. Height 3 to 5 feet. Flowering during April and May and from September until October.

'Starosa' (Van Staaveren) Seems to be a radiation mutant of the preceding. The flowers are a bit smaller but much deeper in colour, without any yellow in the centre and for which there is a small white blotch instead. The plant grows 4 to 5 feet tall and blooms from April until June and seldom during the Autumn.

'Walter Fleming' (Walter Fleming, Head Gardener to Sir Ralph Clarke) A hybrid between *A. violacea* and *A. aurantiaca lutea,* raised before the second World War. The flowers are yellow and white. A very strong grower easily reaching 6 feet or more. Flowering from February right through to December. One of the best for cut-flowers.

'Fleming Sibling' (Walter Fleming) A sister seedling of 'Walter Fleming' with only minor differences. Mostly cultivated mixed and hard to separate. It is in fact slightly more violet tinged on the reverse of the outer petals.

'White Wings' (Van Staaveren-Könst) A radiation mutant of 'Walter Fleming' that is purer white, with only two yellow coloured inner petals. Growing 4 to 6 feet tall. Flowering March until June and from September until October.

'Yellow Tiger' (Van Staaveren-Könst) Another radiation mutant of 'Walter Fleming'. The flowers are deeper yellow than 'Canaria' and the inner petals are more heavily streaked with chocolate. Grows 5 to 6 feet in height. Very vigorous. This variety flowers from March until June and from September until November. It is very difficult to propagate for unknown reasons.

In addition a large number of Goemans Hybrids are unknown to the author.

4. AMARYLLIS CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

1972 ZEPHYRANTHEAE REPORT

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As a first composite report on the Zephyrantheae, some of the notes collected might seem a little out of the ordinary. However, Zephyrantheae is a very unusual, useful and often unpredictable tribe. It is also recognized as being entirely American in origin. *Zephyranthes candida* is said to have been discovered by Juan de Solis at Buenos Aires in 1515. The genus *Zephyranthes* was designated *Atamasco* by Adanson in 1763 and named and described by Herbert in 1821. Dr. Herbert * in subsequent years established *Cooperia, Habranthus, Haylockia, Pyrolirion* and *Sprekelia. Sprekelia formosissima* had been introduced from Mexico in 1593 and was first described as an *Amaryllis. Rhodophiala* was established by Presl in 1844. Much shifting and confusion followed the early work with various Amaryllidaceae and some of the older names still persist.

Modern progress in all areas has speeded recent study of both old and newly collected Amaryllidaceae. In addition to other important work, Dr. Traub rescued *Rhodophiala* from *Hippeastrum* and again gave it independent status in 1956. He placed *Cooperia* and *Haylockia* as subgenera under *Zephyranthes* in 1951 However, in 1963, *Haylockia* was again listed as a separate genus.

Prof. Ravenna (1971), in a continuing study of South American Amaryllidaceae, supported Dr. Traub's original placement of *Haylockia* as a subgenus under *Zephyranthes* and added another subgenus, *Argyropsis.* Dr. Herbert (1837) originally suggested the separate genus name *Argyropsis* for *Z. candida* because it differed in parts from both *Zephyranthes* and *Cooperia.* The name was given in allusion to the silvering effect of the many white *candida* blossoms on the banks of the river La Plata, Argentina. This river was probably named earlier for the same reason. Roemer (1847) accepted Herbert's 1837 classification of *Zephyranthes* and his genus *Argyropsis.*

Dr. Walter S. Flory was kind enough to help me with certain early historical data on this tribe. On *Argyropsis* he remarked: ''Personally, I have always thought that *candida* perhaps deserves to be put over into a new genus; its chromosome number is 38 and unknown in any other *Zephyranthes,* while it has the unusual ridged leaves and perhaps some other characteristics not common to the other members of

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*** Herbert received the degree of Doctor of Civil Law (D. C. L.) from Oxford University; he became Dean of Manchester in 1847, the year he died.**

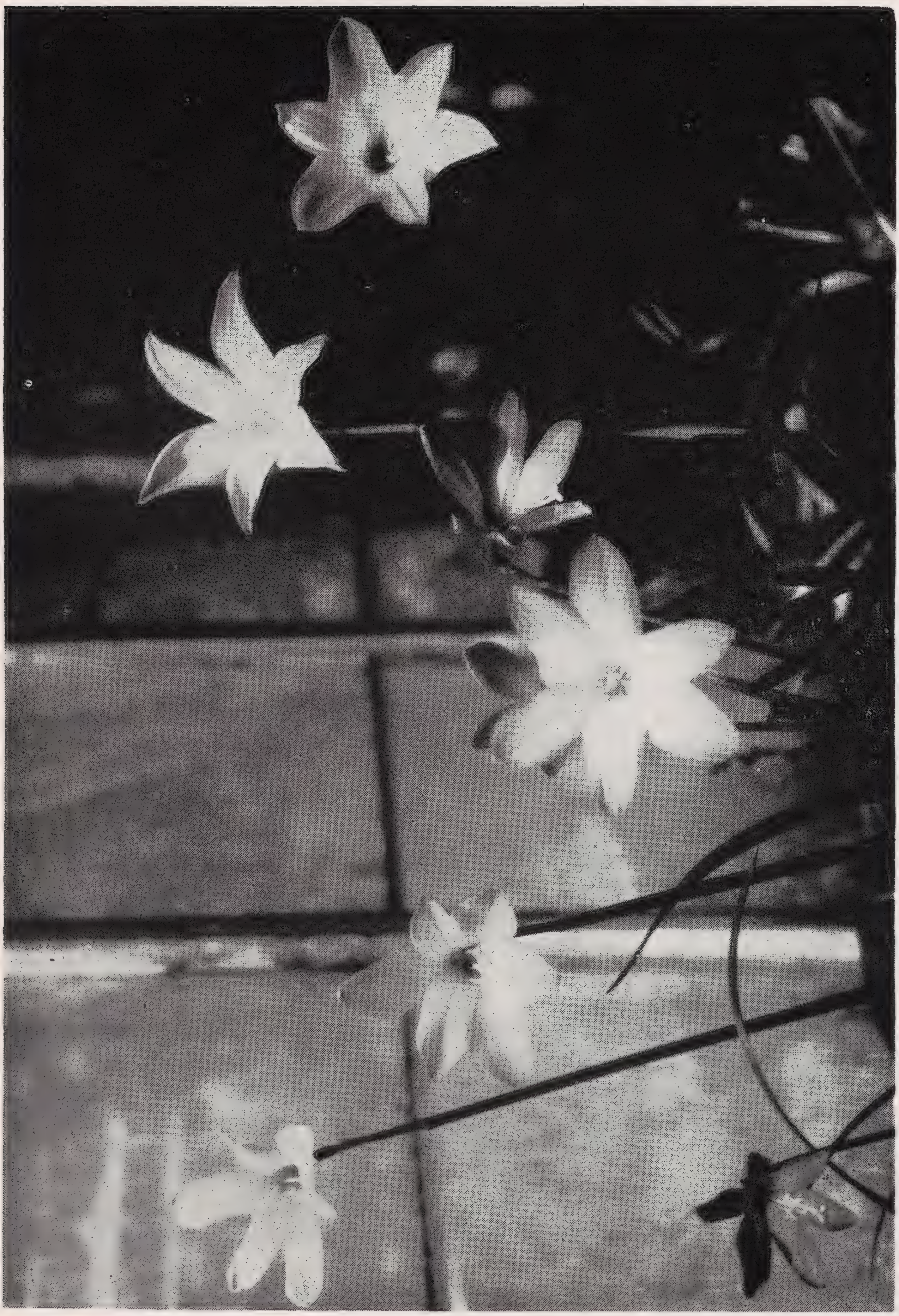

Fig. 20. X **Sydneya morrisii** Traub, bigeneric hybrids of **Habranthus immaculatus** Traub and **Zephyranthes bifolia** (Aublet) Roemer, produced by Katherine L. Clint. Note **Zephyranthes bifolia** in lower left corner.

the *Zephyranthes* genus.''

Prof. Ravenna (1972) has proposed a new genus in the tribe Zephyrantheae: *Famatina.* For this genus, Prof. Ravenna described two new species and reclassified *Phycella herbertiana Lindley.* ''The generic name commemorates the Famatina mountain system, in the province of La Rioja, where the type-species is found.''

The one *Haylockia* species and the three *Famatina* species are illustrated in Prof. Ravenna's articles—see Literature Cited.

BIGENERIC HYBRIDS

X *Sydneya (Zephyranthes* x *Habranthus)*—This group was named by Dr. Traub in 1954, but more fully discussed by him in 1958.

X *Rhodobranthus (Rhodophiala* x *Habranthus)*—This was also named and discussed by Dr. Traub in 1958.

X *Sprekanthus (Sprekelia* x *Habranthus)*—This latest bigeneric ''genus'' was named by Dr. Traub in 1969.

X *Sydneya morrisii (H. immaculatus* x *Z. bifolia)*—Reported by Katherine L. Clint in 1964 (see picture in current report), the beauty of these hybrids is surpassed only by its poor survival rate. A number of bulbs were originally distributed, but only a handful are still around in a few collections. Cultural requirements are as exact (or more so) as for the pollen parent. All attempts at selfing or use of pollen have been negative.

X *Sydneya* 'Teddy Buhler' *(Z. albiella* x *H. martinezii)*—This was introduced by Mr. Alex Korsakoff in October 1970. ''The name is given to honor a 'Floragoof' friend with whom many horticulturally profitable hours were spent in hunting and collecting new and interesting plants in the long, long ago.'' Because of the *Z. albiella* parent, this cross may be tender; however, it has grown well in the ground for me for a complete season (no frost or freeze during winter). It flowers at least as frequently as both parents and offsets like *H. martinezii.* Initial fertility reports are negative.

A Bigeneric, 4-Species Hybrid—Dr. Flory reported on this unusual hybrid of Mr. Korsakoff's in 1968. He found some interesting results with 2n chromosome numbers:

H. robustus (12) x *H. brachyandrus* (24)=*H.* x *floryi* (18)
H. x *floryi* (18) x *H. a. texanus* (24)= *H.* x *(3-species)* (22)
H. x *(3-species)* (22) x *Rh. bifida* (18)=4 seedlings (17)

Dr. Flory noted that the triple interspecific hybrid had 2n=22 instead of expected 21. Also, the final four seedlings studied showed 2n=17 rather than the expected 20. In his summary and conclusions, Dr. Flory states: ''Among certain of the hybrids, particularly in X *Rhodobranthus*, and in the bigeneric, 4-species hybrid, new chromosome types are clearly evident. These hybrids offer promising material in which to study the possible effects of hybrid cytoplasm on the evolution of new chromosome types, and hence of new karyotypes.''

X *Sprekanthus cagei (Sprekelia formosissima superba* x *H. robustus)*—This was named for its hybridizer, Dr. John M. Cage in 1969. Dr. Cage's follow-up report in 1972 should be read by all with special interest. All things considered, *H. robustus* is probably one of the easiest, most versatile of all *Habranthus* species.

CULTURAL PRACTICES

Most of the information collected for this report is about *Habranthus* and *Zephyranthes*, but each genus of the tribe is unique in its own way. *Pyrolirion* is the most exotic in color, having large well formed flowers for size of bulb, and also tend to be ''prima donnas.'' They are sensitive to over-watering when growth slows with cool weather, require a long winter rest and are probably best suited to glass house culture except in the warmest areas. *Rhodophiala* is a bright garden treat for the fall, easy to grow and is generally a more dependable late summer-early fall bloomer in climates too mild to bloom *Lycoris* satisfactorily. They also prefer part shade, which lends versatility. *Sprekelia* has long been popular and some of the more vigorous forms have a repeat bloom. They can stand partial shade and enjoy humus and moisture if very well drained.

General—With generous help from my mother, Mrs. Clint, here are some basic rules for growing *Zephyranthes* and *Habranthus*. Almost all of these bulbs like plenty of light—full sun for at least half a day. A few will tolerate more shade (*H. robustus, H. brachyandrus, Z. grandiflora, Z. insularum, Z. macrosiphon*, etc.). With the possible exception of *Z. atamasco* and the two other Florida natives, most like a neutral or alkaline soil. Where soil and water are both acid, use some form of lime (oyster shell, limestone, etc.) in soil mix and treat water also. Lack of drainage is another cause of failure and a tight, heavy soil can be lightened with sand and well rotted peat or manure. An elevated bed may help. A very sandy soil needs boosting in nutrients, which can be handled by top dressing with bone meal and manure (half and half) and/or fertilizer. Both are better.

It has been suggested that many *Habranthus* and *Zephyranthes* would profit from annual repotting; however, this would be quite a task without help. When bulbs, particularly seedlings, pull themselves down to the bottom of the pot, it is usually to seek more moisture or food. With some species *(C. pedunculata=Z. drummondii)* it is their nature, perhaps for the same moisture reason. A top dressing of half manure and half bone meal helps stave off repotting and gives a usable form of humus and food. Unless bulbs are too crowded, an additional method may be employed to postpone complete repotting: lift soil and growing bulbs, remove some soil from top and sides and replace with fresh soil mix on *bottom* and sides.

Once, Mr. Loren Smoyer wrote that the Florida native *Zephyranthes atamasca, treatiae* and *simpsonii* did not prosper for him at all, while *Z. rosea* and *insularum* grew like weeds. (He lives in southern

Florida.) Reporting some small success with changing potting mix or soil in beds in open, he concluded: "Some *Zephyranthes* just behave like *Habranthus* and that is not a compliment!" Mr. Korsakoff reports no special problems in blooming Florida natives in his greenhouse in northern Florida; however, he has always grown his varoius *Zephyranthes* and *Habranthus* in pots only.

Many *Habranthus* and *Zephyranthes* require a dormant period during the winter. This probably corresponds to a dry winter cycle in their native habitat. Here are two methods to help promote bloom on some difficult bulbs that need this rest:

Korsakoff's Bifolia Treatment—"For *Z. bifolia,* I use only a 4″ clay pot and a rich loose soil with ¼ to ⅓ part of crushed coral rock or egg shell in the mixture. In winter it can be dried up for about three to five months. Feed them slightly once-in-a-while. Temperature in greenhouse never goes below 50° F." This method has worked well for me, even without a greenhouse. From another source: "*Z. bifolia* seems to need special care. In addition to a very rich humusy soil mix, very well drained, we grew them in the greenhouse in pots with a lot of light and water during the growing season. These bulbs were kept on the dry side during the rest period. If soil stays too damp, drainage is not adequate or roots are not active enough."

Howard's Sprekelia Treatment—"Dig in late fall and store in a warm dry place. If the embryo flower buds are formed, they should be in evidence at the neck of the bulb in late winter or spring. This method is recommended only for the most stubborn *Sprekelias,* such as 'supurba.' It only works if the bulbs are mature and healthy." I have had limited success with some of the difficult Mexican *Habranthus* by following this practice. This is particularly convenient for handling bulbs grown in the ground for the approximate season April-December. Two of the most difficult bulbs to bloom are *Habranthus concolor* and *immaculatus.* The final answer to their stubbornness is not yet known. It may also have to do with the presence of special trace elements and/or enzymes in the soil of native habitat.

Naturalizing—In 1972 Plant Life, p. 97, I mentioned my difficulties in trying to establish certain *Zephyranthes* in the lawn by discarding ripe seed capsules. Mr. Fred Jones probably has the best solution. "I planted quite a number of *C. smallii* (large-flowered forms from Brownsville) in our back yard—these look nice after summer rains on a lawn." So, one must choose his favorite species for the locale and plant mature bulbs.

HYBRIDIZING

Apomixis—This is possibly the most important difficulty encountered by persons attempting both interspecific and bigeneric hybrids with Zephyranthes. Diploid parthenogenesis is apparently the type of apomixis most usually encountered in Zephyrantheae. (See Dr. Walter S. Flory's "Parthenogenesis in Zephyrantheae", 1939.) In contacting people very active in hybridizing attempts, all reported this as a major handicap. If viable seeds are obtained in a cross, the bulbs must be raised to maturity to check ''maternal'' or otherwise. Some of the more experienced may be able to check by foliage of seedlings and thus save room for better prospects. It is not easy to generalize, for what will succeed under one set of circumstances, will fail the next Here are some interesting notes from Dr. Howard:

''Parthenogenesis is a bad problem with many Zephyrantheae. I try to avoid the ones that have this tendency, at least as seed parents. I generally use a species on hybrids (or species) that I know do not often do this, such as *Z. rosea, Z.* x 'Ruth Page', 'Texas', 'Kitty Clint', 'Carmen Jones', 'Grace Primo', and most pink or red ones. I think the yellow *Zephyranthes* (including *Z. citrina*) are most apt to tend toward parthenogenesis. Why the pink ones are more innocent I don't know. Some hybrids are notorious too: 'Apricot Queen', 'Prairie Sunset', 'San Antone', 'Fireball', etc. The really odd thing about it is that many of those that are more or less parthenogenic when used as a seed parent in a cross are inclined to throw a small number of interesting variations when selfed, as one would expect in a species when observed in the field. These variations are common within any given species observed in large populations over a wide geographical area. Intraspecific hybrids are to be expected. Thus, a *Zephyranthes* hybrid exhibiting the phenomenon of parthenogenesis is in effect, a ''species'' of sorts in its own behavior, even though it may throw some variations in its maternal seedlings. Since a good species and a hybrid apomict both may show slight variations in a large planting of seedlings, the results are similar, within limitations.''

Mr. Korsakoff has had great success in both interspecific and bigeneric crosses. While the vast majority of his successful seed parents have been pink, white or hybrids, he has managed to include some yellow ones: *Z. howardii, Z. refugiensis, Z. citrina,* Z. Clint 449 (Jacala yellow), Z. Howard 53-1 (Valles yellow), *H. andersonii var. cupreus* and *H. concolor* are a few.

Color—Dr. Howard is still working on a large red *Zephyranthes* hybrid and has produced an improved one, 'Red Witch'. ''The red shades don't all come true when red is bred to red—I get about fifty percent pinks. Red is very recessive; so far the reds tend to smallish flowers for the most part and they are not as free flowering as other hybrids. Actually, color is hard to predict. Pink and rose seem to be dominant to yellow in the first generation. If the yellow comes through at all, it may be in the throat and perhaps in some mottling or streaking. The red color of *Z.* X 'Carmen Jones' puzzles me. I have no record of the cross that yielded it and I certainly used no hybrid or species at that time that was so dark in color. This hybrid has very pale pollen, indicating that perhaps a *Cooperia (Z. smallii?)* was a grandparent, perhaps on both sides. Nearly all *Zephyranthes* and *Habranthus* turn pink, rose or purple as they wither. Even yellow ones like *Z. smallii.* In fact, they seem to change color from the bud stage right on through the withering process—from dark to light, then dark again.''

Mr. Fred Jones produced a *Zephyranthes* hybrid that is a real chameleon. The first day it is one of the apricot shades, but the second day it is pure pink with no hint of yellow overtones. This effect is more pronounced in very hot weather. ''This is a cross made in the fifties between our local *Z. pulchella* and *Z. rosea.* I really don't care much for it because it is so tall and changeable in color, but it has its merits too.'' I have found it to be very vigorous and one of the most ever-blooming hybrids I have grown. Actually, all colors fade, particularly in very warm weather, and the worst are probably pink, rose-pink and the various yellows. In these categories, *Z. rosea* (for rose-pink) and *Z. pulchella* (for bright yellow) possibly have most non-fading pigment as species. When some of the bright yellow South American *Zephyranthes* become more available, they may add a new source of ''non-fading'' pigment.

Seed Set—While many factors are involved in seed set, some remarks in Dr. Flory's 1939 article caught my eye: ''Pollen is known to be comparatively very high in plant hormone content. It is possible that emasculation removes the source of hormones necessary for high percentage of seed set.'' These remarks, while general, were made with some experiments involving *Habranthus andersonii var. texanus* in mind. After hearing many reports of skimpy seed set in hybridizing attempts (some as few as 1-3), I asked my mother to check her records on various *Habranthus* x *Z. bifolia* cross attempts. She did not emasculate in her first *H. immaculatus* x *Z. bifolia* attempt, but did with others, including *H. concolor* and *H.* x *floryi.* The first cross produced 90 good seeds, with 65 bulbs being transplated one year later. Later crosses yielded 80, 88 and two with about 50 good seeds. The smallest number of seeds secured was 27. She pollinated very early and *very heavily,* but did not bag in making crosses among Zephyrantheae taxa. She also used an anther instead of a brush, which gives more pollen. I once used *Z. howardii* in connection with a demonstration for a school project. For me, this bulb rarely opens before noon; so I de-anthered early and pollinated. It was pollinated again at noon, a third time in the late afternoon, and produced a seed capsule about 90 percent full. Seeds were not planted for ten months, but after planting germination started within five days and later appeared complete. In another experiment I de-anthered nine Zephyrantheae flowers. This group included five different *Zephyranthes* and *Habranthus* species that readily set seed when left undisturbed. Seed set was negative. My assumption is that very heavy pollination with a ''foreign'' pollen may furnish the type and amount of hormone necessary for good seed set, even if de-anthered parent plants produce only maternal offspring.

From Dr. Flory: ''In certain taxa unreduced eggs occur which will not develop into maternal seedlings unless the flower is pollinated and the pollination results in fertilization of the endosperm nucleus. In some cases such plants may be self-pollinated or they may be cross-pollinated with the pollen of various other species. But unless the endosperm is successfully fertilized so that it will develop and furnish nutrition for the eggs, these unreduced eggs will not develop into embryos and seedlings. This is the case with *H. andersonii var texanus.*''

CURIOSITIES

The *Habranthus* and *Zephyranthes* are individuals in every respect. They are cooperative and obstinate, predictable one year and then the opposite—but always fascinating to the grower. Hybrids seem to have their own peculiarities too. There is one trait common to most all growers of small bulbs: they are observant.

Double Flowers—The keen eyed Dr. Herbert (1837) was probably the first person to report on this strange habit. He grew a special form of *Z. candida* ''which flowers year after year with eight segments to the flower, eight stamens, four lobes to the style, and four cells to the capsule. . . this is the only instance I have observed of a seedling with such a variation permanent.''

In 1961, Mr. Alek Korsakoff reported on doubleness of *Habranthus brachyandrus* and *H.* x *floryi.* He still has bulbs grown from seeds of his original double *brachyandrus:* ''They sometimes bloom normally. Several times I have had blooms with 11-17 segments, but never as double as that bulb. *Zephyranthes rosea* very often has 8 segs. and *H. robustus* has had as many as 9.'' His bulb of Howard's *Z.* x 'Big Shot' (which has *Z. rosea* in background) is equally strange. Before 1969 it had 8 segs. five times. In 1969 it bloomed *eight* times— four times with 8 segs. and four with 6, but no special pattern. In 1971 it bloomed with 6, 8 and 6.

From Dr. Thad Howard: ''Most individual scapes produced in a single season from one bulb are *9.* This happened on a single specimen of *Z.* x 'Fireball'.'' (This has *Z. rosea, Z. citrina* and *Z. smallii* minor in background.) ''The only reason I took note of this was because it first flowered with twin flowers (two in an umbel). Naturally this caught my eye and I marked the bulb with a label to see if it would do this again. It did, but it alternated from a single flower to twins. The ninth effort was a three flowered umbel! The flowers did not open at once, but in succession, with only two open at one time. I once had a small form of *Z. smallii* flower in a twin umbel and I know Kitty Clint found a pink *Zephyranthes* from Mexico doing the same.'' This was one or the *Z. clintiae* group flowering under cultivation (see picture in 1957 Plant Life, p. 20). ''I also found a double flowered *Z. smallii* with twelve segs. It looked like a little rose. Doubleness is common in hybrids from *Z. smallii,* regardless of which forms. My own *Z.* x 'Twinkle' runs to doubleness and its seedlings (parthenogenic?) are similar, including the doubleness feature. The trouble is, these things are rarely consistent. Whatever goes haywire in producing these freaks does not last and the same bulb reverts back to doing the normal thing. At least this has been my experience.''

From Mrs. Katherine Clint: ''Along this same line, I have observed quite a few twin flowered *Z. smallii* in the fields (and one or two under cultivation); also double flowers, particularly in the larger form. I have also noted the habit of both twin flowers and doubling of segments in *H. robustus* and *H. brachyandrus.* To a lesser extent the doubling shows up in *Z. grandiflora, H. immaculatus, H. concolor* and some of the Mexican *Zephyranthes.* These phenomena are rarely repeated and the trait is apparently not often passed down to seedlings. Or, perhaps I wasn't persistent enough in my seed planting.''

One weird experience I had with a volunteer bulb of *H. brachyandrus* occurred in early spring of 1971. The leaves came up triple in size, then an enormous scape appeared and three individuals bloomed simultaneously. In 1972, the first bloom of the season from this bulb was one normal scape and one twin flowered scape. Both twin flowers had extra segments. In addition, one flower contained seven stamens and the other only four.

From Mr. Loren Smoyer: ''*Habranthus robustus* often flowers double or sometimes triple for me, but only during the months of December, January and February. So, it has to do with low humidity (?), low temperatures (?), or what?''

Dr. Howard suggested that the ''or what?'' could be a tendency toward mutation, even though it is not permanent. After reading about Dr. Herbert's *Z. candida* with the permanent variation, who knows what might show up in the future?

Records—Because of their ability to bloom repeatedly in a given year, the *Habranthus* and *Zephyranthes* are an easy target for a little bragging. Dr. Howard's *Z.* x 'Fireball' mentioned earlier is bound to top them all, with nine scapes from one bulb in a season. This included four twin and one triple flowered scape out of the nine. Count the flowers! Mr. Korsakoff's single specimen of *Z.* X 'Big Shot' is just right behind with eight scapes in 1969. Mr. Korsakoff also has a clone of a pink Mexican *Zephyranthes* (K-484) received a number of years ago from Mr. Wyndham Hayward that is peculiar in a different way. ''If well cared for, it will bloom each month of the year.'' While my care of offsets from this clone is not the very best, K-484 is liable to bloom during any winter month, hot summer month, and spring and fall. While managing all of this, it also offsets rather rapidly!

Howard's 53-1 *Z.* sp. (Valles yellow), with a somewhat low chromosome number of 28, is known to be very floriferous when well established in the ground. Under cultivation in Brownsville, Texas, I have seen several individual bulbs bloom with two to three scapes at one time. Back in 1955, Dr. Howard bloomed a solitary bulb of ''Valles yellow'' with *five* individual scapes which opened simultaneously. Now that is quite a bouquet! *Zephyranthes smallii* is another heavy bloomer when conditions are right, but I don't think it has ever out-bloomed the ''Valles yellow'' *Zephyranthes.*

When I first started planting a few Zephyrantheae seeds, I was told that some blooms might occur within a year if the seedlings were forced, but that most would bloom by the second year. Since the time it takes my seedlings to bloom is more like two to three years, I was very impressed to hear that Thad Howard once bloomed Z. x 'Apricot Queen' in *nine* months. "These had the benefit of being kept in active growth the first winter in a greenhouse."

Mr. Richard Tisch has a reverse record of sorts. He flowered two seedling *Z. drummondii (C. pedunculata)* in late November, 1971. This timing of bloom is unusual enough, but the seed capsules took *seventy-four* days to mature. Depending on weather conditions and clone, this is generally achieved within three to four weeks.

NOTICE: Mrs. R. V. Mutton, 28 Burran Ave., Mosman, New South Wales, Australia 2088, writes that she is interested in the small amaryllids and would like to be contacted by Australian members of this Society. Other Australian members who wish to give their addresses may write directly to me and this information will be included in each annual report.

Editorial Note.—Additional requests from Australia for seeds of *Amaryllis* and the Zephyrantheae have been received:

Mr. V. T. Vail, 93 South Terrace, Como, Western Australia 6152 (Amaryllis).

Mr. B. York, 24 Mulgowie St., Sunnybank, Brisbane, Queensland, Australia (Amaryllis).

Mr. Lindsay J. Forbes, 59 Union Road, Surrey Hills, Victoria 3127, Australia (Zephyrantheae).

Mrs. W. J. Brooks, 347 Kissing Point Road, Ermington, N. S. W., 2115, Australia (Zephyrantheae).

LITERATURE CITED

Cage, John M. 1969. Bigeneric Hybrid of *Sprekelia* and *Habranthus. Plant Life,* 25: 77-78.

_________. 1972. Chromosome Number and Growth Habit of *Sprekanthus Cagei. Plant Life,* 28: 72.

Clint, Katherine L. 1964. A New Bi-Generic Hybrid—*X Sydneya Morrisii. Plant Life,* 20: 73-74, 34.

Flory, Walter S. 1939. Parthenogenesis in Zephyrantheae. *Herbertia,* 6: 196-202.

_________. 1968. Chromosome Diversity in Species, and in Hybrids, of Tribe Zephyrantheae. *The Nucleus,* Calcutta, India, pgs. 79-95.

Herbert, William. 1837. *Amaryllidaceae.* J. Ridgway & Sons, London. p. 177.

Korsakoff, Alek. 1961. Doubleness in *Habranthus. Plant Life,* 17: 93.

_________. 1970. New Introductions. *Ozark Gardens,* Julian, California. October: p. 8.

Ravenna, Pedro F. 1971. Contributions to South American Amaryllidaceae IV. *Plant Life,* 27: 67-72.

_________. 1972. *Famatina* Gen. Nov., Amaryllidaceae. *Plant Life,* 28: 55-62.

Traub, Hamilton P. 1951. Amaryllid Notes. *Plant Life,* 7: 43.

_________. 1954. Amaryllid Notes. *Plant Life,* 10: 46-47.

_________. 1956. The Genera *Rhodophiala* Presl and *Phycella* Lindl. *Plant Life,* 12: 67-76.

_________. 1958. Crosses Involving *Rhodophiala, Habranthus* and *Zephyranthes. Plant Life* 14: 47-51.

_________. 1963. *The Genera of Amaryllidaceae.*

_________. 1969. X *Sprekanthus,* Bigeneric Hybrid. *Plant Life,* 25: 78.

IN QUEST OF MINIATURE AMARYLLIDS

Lindsay J. Forbes, *59 Union Road,*
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Australia is well known for its kangaroos, aboriginals and large areas of dry barren ground. We also have a white population who find that our supply of rare bulbs is just as barren as large tracts of our land.

This is, at times, a frustrating situation as Australia's coastal belt from North Queensland to Southern Tasmania and in parts along our southern coastline has the possibility of giving almost natural growing conditions to a wide range of plants from orchids in tropical Queensland to the rarest of cold climate alpines in the mountainous areas of Victoria and Tasmania.

Our difficulty here is to establish in the Southern Hemisphere plants which grow naturally in the Northern Hemisphere. The acclimatization of green material or bulbs presents many problems, not the least of which are our Quarantine regulations. A safer method is to obtain fresh seed but few gardeners have the time or patience to wait, in some instances, nearly a decade to admire the fruits of their labours.

There is an ardent band of professional growers who do their best to import new material into Australia, but they frequently suffer large losses of stock. This results in rare material not being available until stocks have been built up by natural increase.

The ardour of the professional is often surpassed by the amateur who is impatient to find that elusive bulb he has admired in his favourite bulb book. This results in the amateur turning to the importing of his own material.

Over the past few years I have imported much material from Europe. I have enjoyed considerable success in importing Crocus, *Chionodoxa, Scilla* and Nerines, moderate success with Cyclamen and *Narcissus* but poor results with *Tulipa* and *Fritellaria* species.

Looking now at the situation with Rain Lilies, the same scarcity of supply pertains. A few misnamed species are available from growers in Victoria. *Zephyranthes candida* is about the only variety available in chain stores, provided one is able to identify it under the names of "Autumn Snowflake" or "White Crocus." *Z. grandiflora* can be obtained in small supply while one may also find on occasions *Z. macrosiphon, Habranthus robustus* and *H. andersonii.*

My interest in Rain Lilies started some years ago when I read in one of my bulb books that Dr. Thad M. Howard of Texas had developed a number of more brightly coloured *Zephyranthes* and that a great variety of new colours and types have appeared.

Supplies were not available in Victoria, but I was delighted to hear from a correspondent who has one of the largest collections of small amaryllids in the U.S.A.

I have now reached the present day and have received recently four consignments of bulbs, all of which were grown in our Quarantine Nursery.

There are Quarantine Nurseries in the capital city of each state. While the authorities like importers to have material addressed c/o the Quarantine Nursery, this is not always practical. Any overseas correspondent is likely, at any time, to post one a present and advice of dispatch is not known in time to tell the sender the address to use.

The "Q" Department will accept health certificates from overseas provided the certificates state that the material has been subjected to cyanide fumigation or the hot water treatment; i.e., 1½ hours immersion at 110° F. Without certification, methyl bromide is used as a fumigant by our authorities at the rate of three pounds per 1000 cubic feet for four hours at 70° F. Particular attention is given to bulbs coming from areas known to have Narcissus Fly or the bulbs likely to be prone to Narcissus Fly, whether or not they are from an area known to have it. Plants or bulbs are then grown until declared free of virus by a government plant pathologist. More attention is devoted to new growth than to old. Charges are extremely low. Fee for inspection and fumigation (per consignment) is 25c, and $1.00 per square foot for space occupied at nursery is charged (no time factor). Release depends on how soon new growth is made. My first consignment of dwarf amaryllids was released after just two months in "solitary confinement." *Narcissus* don't start growing so quickly and may be there six months. There is no rule for release. It is just as soon as the material has been growing for say two months.

Rare rhododendron, daphne scions or green alpine plant material is often damaged through fumigation and they have little chance of survival. Bulbs or dormant rootstocks, strangely, do not react unfavourably.

The "Q" authorities are quite receptive to special growing instructions. If there are not any special requirement, they use as a basic mix one part sterilized loam, one part peat moss and one part coarse sand. All material is grown in pots and the proportions of the mix may be varied according to the importer's wishes.

A minor crisis arose when one of my consignments arrived containing *Zephyranthes bifolia.* Planting instructions were that the mix should contain crushed coral rock or crushed egg shells. No, they didn't have either!! Egg shells were quickly organized from a local poultry farm and much to the amusement of all concerned, I ceremoniously presented them with a bucket full!

It is pleasing to see how well small amaryllids adapt themselves to the opposite season. This is probably on account of their short, if any, period of dormancy and they do not have to remain planted for long periods in a dormant state and in an opposite season. Melbourne has a very moderate climate and heavy frosts are rare, so I am looking forward to successful transplants and sharing here in Australia the pleasures of the Rain Lily fan club.

COJOMARIA, PARAMONGAIA WEBERBAUERI

MARVIN ELLENBECKER, *Wisconsin*

The Amaryllis Family has given us many fine ornamentals for conservatory and outdoor gardening. Some of them, such as the *Clivia, Amaryllis, Nerine* and *Haemanthus,* have been grown and prized by horticulturalists for many years. Recently a new amaryllid, *Paramongaia weberbaueri* Velarde, has been introduced into cultivation. I am confident that it too will become a much desired ornamental in the near future. This paper will begin with the history of this lovely amaryllid's introduction into cultivation followed by a botanical description of the plant. Next the cultural requirements will be presented and the paper will conclude with a discussion of its potential breeding possibilities.

The plant explorer is responsible for introducing a plant into civilization from the wild. The first introduction of *P. weberbaueri* Velarde into the United States occured in 1949 when Dr. Ramon Ferreyra, of the Universidad Nacional Mayor de San Marcos, Lima, Peru, sent bulbs collected from the coastal region near Huarmey, Peru, to Dr. Hamilton P. Traub for identification purposes (7,10). Traub, who is considered the authority of the *Amaryllidaceae,* grew and flowered the bulbs. He confirmed it as *Paramongaia weberbaueri* Velarde, and was able to set seed on the first plant to flower(7). The seed was distributed to ten amaryllid enthusiasts and one of the recipients was Longwood Gardens(8). At Longwood Gardens the seed was placed under accession number 572124 and the seedlings first flowered in 1966(6).

The second introduction occured quite unexpectedly in January of 1965 when Dr. Russell J. Seibert, Director, Longwood Gardens, Mrs. Seibert, and a friend, Betty Collins, were traveling through Peru on the Huaráz-Casma Road. They met an Andean Amerindian on horseback who was carrying a large bouquet of lovely yellow flowers. They inquired about the flowers and the man replied, ''Cojomaria'', pointing in the direction from which he had come. They proceeded and soon came upon three children by the roadside selling the same bouquets. Dr. Seibert recalls that the flowers were remarkable. The blooms were somewhat like large daffodils with flowers 8″ in diameter and of a butter yellow color. The flowers also had a distinct fragrance. They purchased a bouquet and continued on their way. A short distance later they came upon a slope near the roadside that was covered with the identical blooms. This slope was above the village of Pariacoto, Department of Ancash, at an elevation of 10,000 feet. Dr. Seibert estimates that the blooms covered an area of perhaps a thousand acres on a steep slope made of weathered granite with little other vegetation. He did not have any tools for collecting some of the bulbs but soon discovered that a tire jack handle works fairly well for digging bulbs (as well as for changing tires). The bulbs were at a depth of a foot making their removal from the steep slope a difficult undertaking. However, with the aid of the tire instrument and words of encouragement and caution from Mrs. Seibert, he was able to collect seven bulbs, two of which were in flower and measured 2½″ in diameter. The bulbs were taken to Lima where a local botanist later identified them as *Paramongaia weberbaueri*. Six bulbs were sent to the United States Department of Agriculture at Coconut Grove, Florida, and later five of them were forwarded to Longwood Gardens in April of 1965 and placed under accession number 65522(5,6).

The debut of this amaryllid occured only twenty-three years ago and we are deeply indebted to Velarde and Dr. Seibert for bringing us the ''Cojomaria'' from its native habitat, Peru.

Botanically *P. weberbaueri* is unique enough to be placed in its own genus with one species. It was named after Dr. Weberbauer who specialized in the flora of Peru(7). As mentioned previously, it belong to the Amaryllis Family taxonomically because of the following characteristics common to amaryllids.

(1) the scape or flower stalk is entirely devoid of leaves.
(2) the inflorescene is an umbel or in this case a modified umbel.
(3) the ovary of the flower is inferior (borne below the perianth) whereas with true lilies the ovary is superior (borne above the perianth)(3).

Traub places it in Tribe 21(Stenomesseae) of the Amaryllis Family which is between the *Hymenocallis* and *Pancratium* groups(7,9).

Paramongaia weberbaueri Velarde is native to Peru and is found in two geographical areas of that country. One location is in the mountains on the slopes of Lomas above Paramonga and on the coast near the city of Huarmey(9). The other location is in the mountain region where Dr. Seibert collected his bulbs. There is speculation that the ancient Incas cultivated this bulb and may have brought it from the mountains to the coastal plain(5).

In horticulture we are constantly searching for new and unique plants that can be cultivated. A plant's cultural requirements are important to us and for *P. weberbaueri* we want to know the conditions under which to grow it and what potential it has as an ornamental.

The culture of this amaryllid is still not fully known. However, Longwood Gardens has done a great deal of work pertaining to the cul-

Fig. 21. Reproduced from painting by Betty Collins, by permission, showing contrast between man and nature: virile Andean Amerindian man cast against an equally virile background of the majestic Andean Mountains of Peru; and holding a delicate bouquet of flowers (**Paramongaia weberbaueri**), showing harmony with his natural domain.

ture of this bulb and its potential as a conservatory ornamental. The credit for this work goes to the people in the experimental greenhouses located at Longwood Gardens.

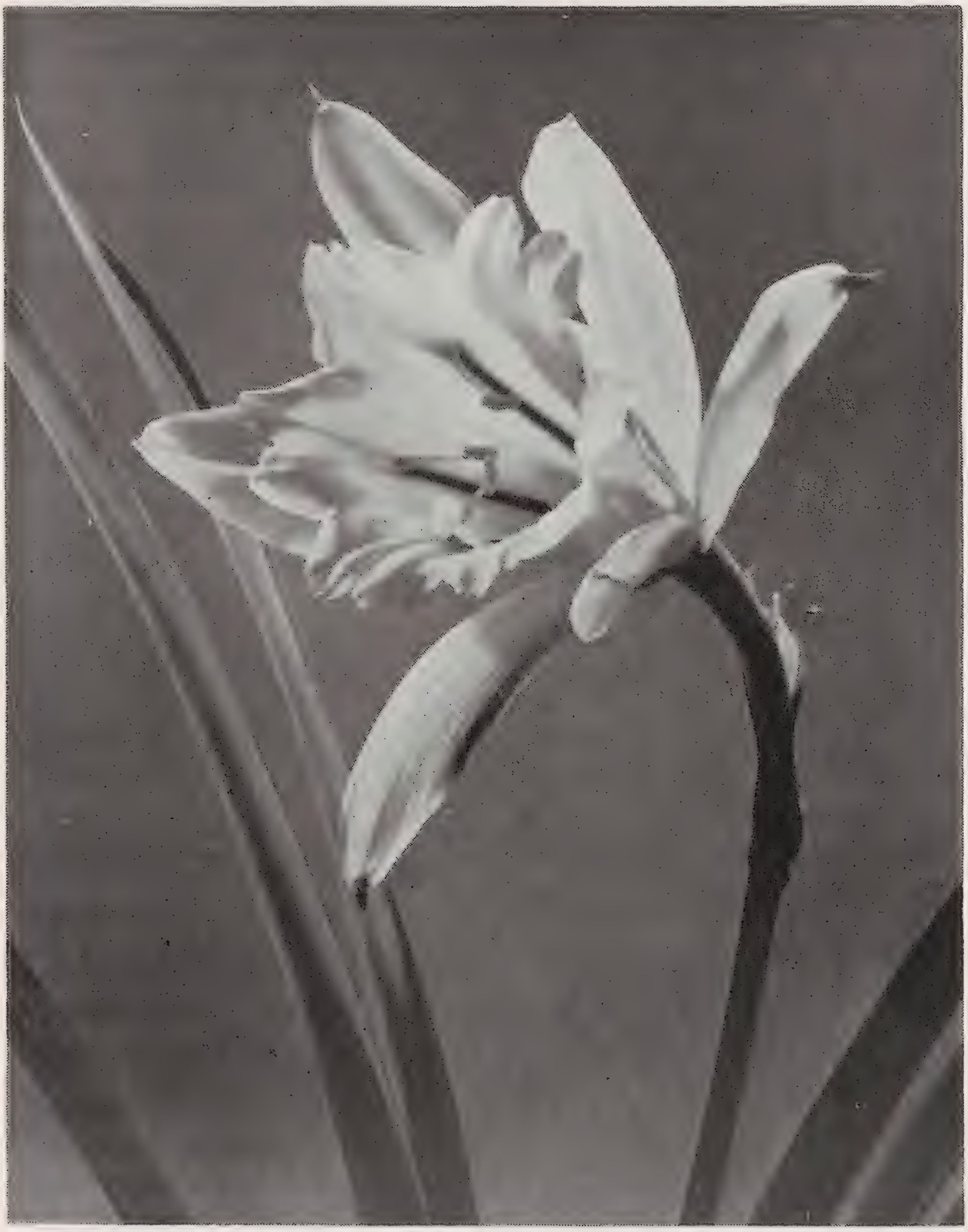

Fig. 22. Flower of Cojomaria, **Paramongaia weberbaueri** Velarde, native to the Andes of Peru. Photo Longwood Gardens.

Paramongaia weberbaueri has attractive strap-like leaves of a medium green color. It is similar to most other amaryllids in that it flowers best when potbound. The flowers are borne on 2' scapes above the leaves and resemble giant daffodils. Individual blooms are 7″ in diameter, of a bright sulphur yellow color and fragrant. Each flower lasts 8-10 days but only 2-3 days if used as a cut flower. Normally each scape has one flower.

The information given above and following was obtained from an interview with Jesse Grantham who works on the research program on *P. weberbaueri* at Longwood Gardens. The bulbs are grown in a medium consisting of equal parts soil, sand, peat, turface, charcoal, leafmould and a pinch of lime. This mixture is well-drained with a pH of 6.0-6.5.

The bulbs start into active growth in October and each bulb produces 6-7 leaves. The recommended temperature is 70-75 F. during the day and 65 F. at night. The humidity is held at 65% with a constant circulation of air. Water is given freely and the plants are grown in full sun.

The blooming period varies for the two accessions. Those bulbs from the coastal region of Peru(Acc. 572124) flower the last two weeks of October and first two weeks of November. The bulbs from the mountain region(Acc. 65522) flower later(late November to early January) and their foliage, unlike that from the coastal region, is still undeveloped when the plants are in bloom. The goal at Longwood Gardens is to develop a suitable culture for *P. weberbaueri* that would enable the bulbs to be displayed in the conservatory when in bloom(October-November). To do this a breeding program is being conducted where the two accessions are being crossed in hopes of a more vigorous plant that will have a definite flowering period for display purposes. At present bulbs under Accession 572124 have the better display qualities(2). Whether this is due to the bulbs being native to an area where there is a milder climate and longer growing season which favors a longer growth cycle or if there are definite morphological differences between the two accessions has not been determined though it certainly is a point of interest.

Cold hardiness tests on the ''Cojomaria'' have also been done at Longwood Gardens experimental greenhouses. Bulbs were potted on October 13, 1970, in a 1:1:1 soil mixture of peat, soil and perlite with lime and superphosphate added. The pots were placed in a rooting room at 50 F. to determine cold tolerance and whether the bulbs could be forced in a manner similar to that of daffodils. One group was subjected to a temperature of 38-40 F. and then the temperature was gradually raised. On April 7, 1971, the flower scapes had appeared but it was evident that the flower buds had blasted. The other group was kept at 50 F. until January 10, 1971, and then the bulbs were given a temperature of 35-38 F. until February 26, 1971. On April 7, 1971, the bulbs were inspected and were found to have rotted in the pots. These tests would indicate that forcing *P. weberbaueri* is not feasible(2). It is a tender amaryllid requiring treatment similar to that for *Hymenocallis* or *Pamianthe peruviana*.

After the plants finish blooming they soon give an indication of going dormant. The bulbs should be gradually dried off and stored at a temperature of 65-75 F. and a humidity factor of 20-40%. The bulbs may be kept in the same pots or stored in vermiculite(2). This dormancy occurs approximately six months from the time when active growth begins. With such a growth cycle a culture similar to that of the *Gladiolus* might be possible provided the cycle for *P. weberbaueri* could be reversed to coincide with our growing season in the temperate zone of the Northern Hemisphere.

A definite advantage that *P. weberbaueri* possesses is the ability to propagate readily from offsets and seeds. Mature bulbs usually produce two offsets each season and these offsets will reach maturity in 2-3 years. Propagation by seed, of course, takes longer. Each seed pod produces between 125-150 seeds and the seeds reach maturity about 6-8 weeks after pollination. When sown, the seeds germinate in 15-18 days and the seedlings are transplanted to pots two months later. They remain in active growth for two years after which a dormant period occurs and a pattern is established similar to that of mature bulbs. However, at Longwood Gardens dormancy has occurred three months after the seedlings had germinated. These seedlings are a cross between the two previously mentioned accessions. The change to an active-dormant cycle does not necessarily mean that the plants will bloom the next season.

Paramongaia weberbaueri appears to be relatively free from diseases and pests. The bulbs grown at Longwood Gardens have shown that red spider could be a problem though this has not been of any significance(2).

The plant breeder cannot help but to look upon the fine qualities that *P. weberbaueri* exhibits without desiring to improve them. This is what Longwood Gardens is doing in crosses between the two accessions. Likewise, the possibility of an intergeneric cross becomes a challenge to the plant breeder. A cross between *P. weberbaueri* and closely related genera *(Pamianthe peruviana, Hymenocallis* or *Pancratium* sp. to name a few) still requires documentation. Genetic factors that still are unknown are its chromosome number, isolation of the species, compatibility with the above mentioned genera and, in addition, possible morphological differences(4).

Paramongaia weberbaueri is also known outside the realm of horticulture. Betty Collins, who accompanied Dr. and Mrs. Seibert on their trip through Peru when they discovered the ''Cojomaria'', has made it the subject of one of her paintings. This work of art depicts a beautiful contrast between man and nature. The Andean Indian is a virile-looking man cast against an equally virile background of the majestic Andean Mountains of Peru. Yet in all of these strong features a delicate bouquet of flowers *(paramongaia weberbaueri)* softens the masculine tones and gives beauty to a scene in which man is in harmony with his natural domain(1). Mrs. Collins has very generously given me a print of her painting of which a copy appears at the beginning of this paper.

Paramongaia weberbaueri is in my estimation a fine amaryllid worthy of more attention in the world of bulbous plants. It is hoped that this overall view has shown the possibilities that it has as a fine ornamental. I am indebted to the many people who have so graciously shared their experiences concerning *P. weberbaueri* with me.

REFERENCES CITED

1. Collins, Betty. Artist. Wilmington, Delaware. Personal interview on her painting of the ''Cojomaria''.

2. Grantham, Jesse. Senior Gardener, experimental greenhouses, Longwood Gardens. Personal interview on culture and research done on *Paramongaia weberbaueri.*

3. Huttleston, Donald. Taxonomist, Longwood Gardens. Personal interview on taxonomy of the amaryllis family.

4. Lighty, Richard. Coordinator, Longwood Gardens Master's Program. Personal interview on genetics and plant breeding concerning *Paramongaia weberbaueri.*

5. Seibert, Russell J. Director, Longwood Gardens. Personal interview regarding the collection of *Paramongaia weberbaueri* in Peru.

6. ——. 1967. ''Cojomaria—*Paramongaia weberbaueri* Velarde, from Peru''. *Plant Life.* Vol. 23(1). The American Plant Life Society. La Jolla, California. 43-5.

7. Smith, Joseph. 1958. ''The Paramonga Lily''. *Plant Life.* Vol. 14(1). The American Plant Life Society. La Jolla, California. 93-4.

8. Traub, Hamilton P. 1958. ''Sending Seeds by Mail''. *Plant Life.* Vol. 14(1). The American Plant Life Society. La Jolla, California. 93-4.

9. ——. 1963. *The Genera of Amaryllidaceae.* The American Plant Life Society. La Jolla, California. 73.

10. Velarde-Nunez, M. Octavio. 1949. *Lilloa.* 17:489-500.

EXPERIENCES WITH AMARYLLIDS, 1971-1972

RICHARD E. TISCH,
Woodland Hills, California

General. The outstanding feature of this area's growing year was the abnormally low rainfall from early winter to late spring. Its first apparent effect was on the *Narcissus* crop outdoors. There was not enough deep ground moisture for the bulbs to absorb during the late winter leaf growth period, and they could not sustain that growth against the dessication of our periodic hot dry ''Santa Anna'' winds from the inland desert. Daffodil leaves and flowers were not as robust as usual and were short-lived. Seed set was disappointingly scattered. This low moisture level will affect next year's *Amaryllis* flowers by not providing good growing conditions through the spring-summer leaf production period. Supplementary watering with medicated city water via the garden hose cannot compare to deep soakings with fresh, clean rain water which normally occur from October to April.

Amaryllis hybrids. The planned program for breeding hybrid

Amaryllis for vigor plus flower quality was continued unchanged in its basic format of three steps. Firstly, following protected and accelerated leaf and bulb growth in plastic dish pans during the seedling stage, the plants are flowered in individual plastic pots, and additions to the breeding stock are selected. From plants with outstanding flowering characteristics, pollen is taken and refrigerated for use on existing stock plants and on next year's flower crop. Such plants are set out into beds to check their outdoor growing habits. Plants with undersireable scapes or flowers are discarded, unless their growth is exceptional, in which case they are also set out into beds.

Secondly, following a summer's leaf growth and a winter's exposure to wet and cold, plants which grow poorly are discarded, unless their flowers continue to be exceptional. Plants with especially desireable flowers, for general or specific features, are used as both pollen and seed parents. Only plants with vigorous growth are used as seed parents. Thirdly, seedling records are kept and evaluated, and parent plants which have not produced offspring with desireable characteristics are discarded. The evaluations involve gradings for both quality and quantity in that a plant which produces only one or two excellent seedlings, and a plant which produces many better-than-average seedlings probably both warrant being kept. In some cases a plant is carried over in order to review its performance during its second or third outdoor season, which is its repeat-flowering time. It is known to most breeders that some perennials take a certain time to stabilize, and that this period is variable from seedling to seedling. Such stabilization may include adjustments to exposure, soil condition, planting depth, drainage. A plant which had a good first flowering may react adversely to being set outdoors and have a poor second season, then come back with an excellent third season. The exact symptoms of this are difficult to describe. Discernment comes with experience, observation, thorough record keeping, and patience.

In my stock there are several plants which have been carried along for several years because they continued to perform creditably. However, each year some of the holdovers lose favor. Last spring, for example, of those which had been retained as breeding stock since flowering in 1964, 17 were finally discarded. Further, the criteria for being saved for use have gradually become more restrictive; of those which flowered for the first time in 1972, only five were kept. Of these five, three represented the start of a series of successes which resulted from a violation of one of the program's rules: a plant with exceptional growth habits was used as a pollen parent.

The plant used, previously described in this publication, is unusually large and strong, resembling a *Crinum* in its large tapered bulb, generous production of bulblets, abundant leaf growth constantly produced all year (even in the cold of winter!) and its voracious appetite for water and supplementary fertilizer. Its flowers, although a huge glowing orange-red, flaring out boldly four at a time from atop strong towering scapes several times during the year, must be graded as "only fair." They tend to tilt sideways, to recurve excessively, to look "snaggle toothed" because of separated segs, and they have green striping in the throat. Normally this would be more than enough to obviate its being used as a pollen parent. But its coloration, which is especially vibrant and glowing in the morning and late afternoon sunlight, has an exciting quality which elicits exclamations from viewers.

For use as a seed parent, one of my favorites, *A. striata,* was selected. Its rating as tender and not a desireable candidate for participation in a breeding program by many of my colleagues has given me a feeling of sympathy for this floral Cinderella. As I ruminated grumpily over material from books and conversations about species, I decided to try to use its grace and gentle beauty in spite of the warnings. Even though my own experiences have confirmed that it is indeed tender in this climate and tends to deteriorate outdoors, I like its prolific production of offsets and its habit of trying to make a come-back each summer. It seems to have a strong will, to want to grow and flower in the face of adverse conditions. In short, it seems to me to be more than "just another pretty face".

This year the flowers from a cross made in 1968 of the above-described big red-flowered plant onto a small *A. striata* flower on a slender 22 centimeter long scape have justified my faith in the so-called "Apricot Lily" as a good mother. The first blossom was a doublet or radiant tangerine carried aloft by a tall, graceful scape rising alongside and above wide, strong, bright green leaves. In the partial shade of a Silk Oak tree's spreading branches, the nodding flower's color glowed in the early evening light as the scape swayed in the soft breeze.

To permit maximum bulb development, no crosses were made. I needn't have been concerned. When the plant was lifted, there were six large healthy bulbs to send to a friend in Texas for trial in that climate. There were also 21 medium sized to small bulblets to go back into the bed for future stock. Since then, four other of these crosses have flowered, each with different color tones from light buff to bright orange-red. The blossoms are held horizontal, with the face tilted slightly to show the flower's interior from above. It's form is near lily-shape, much as the classical *Amaryllis belladonna.* The plant's overall appearance is such that I think of it as my 'Pelegrina' type. All the plants in that bed retained strong leaves all winter. All have many offsets. All have moved upward in the soil so that the larger bulbs, which are flat and bright green and almost devoid of loose brown outer scales, sit atop the surface of the bed.

Inasmuch as it has been reported that *A. striata* has "naturalized" in Florida and Hawaii, if readers in those two areas who are willing to test these plants outdoors and report on results will write for bulbs, I will be pleased to send them some as extras become available. Meanwhile, there are other crosses involving *A. striata* coming along. These used plants with better flowers than the one described above. On advice from other hybridizers, back-crosses have already been made using later flowers. In succeeding years there will be additional information about this series of crosses.

A. petiolata (syn.—*A. argilagae*). This plant still resists attempts to make it flower. Now six years old, one of the original bulbs has produced many offsets for a total well into the hundreds, many of which have been distributed to local plant fanciers and breeders. A review of its descriptions in the 1966 and 1967 issues of Plant Life inclines me to believe that in its native state it relies more on bulblet production than on seed production for survival. The way that the bulblets harden off and work their way to the surface and float around when the plant is heavily watered leads me to imagine that seasonal floods carry the loose bulblets downstream where they eventually lodge in muddy pockets as the water recedes, there to sink roots and put up leaves—and produce more bulblets. So far I have tried relatively long periods of alternate soaking and drying out, coupled with positioning the plant in dense shade and bright sunlight. When in the shade and kept wet it produces leaves and more bulblets. When dry and in the sun it goes semi-dormant as if waiting for the return of the shade and water. This summer I set all but the largest offset plants out in a bed in the shade of a Birch, where they will get only morning sun and will be kept damp and cool most of the time. This will be an attempt to let the plants decide for themselves when to grow and when, if ever, to flower. I am anxious for flowers because I want to combine the prodigious bulblet production with the ready flowering and hardiness of our local hybrid *Amaryllis.*

Amaryllis from Colchicine-treated seeds. One group of hybrid *Amaryllis* seeds which had been soaked in a colchicine solution prior to being planted in 1964 resulted in beautifully shaped flowers with no green in the throats. Most were pink toned. One was a solid rose pink of excellent form; flowers carried on a strong scape, flowering along with strong, upright leaves. Another was a pure white, also of excellent form. Now, two years after their first flowering, only the rose-pink remains strong and unaltered; but it has made no bulblets. All the others exhibit deformities of root growth, bulb formation, platelet shape, along with hesitant and incomplete leaf and scape formation. Having grown slowly since seed germination, with very high mortality as small seedlings, and requiring five or six years to mature to first flowering, they now are retrogressing to a state of bare existence. Most of them displayed extra-large, spectacular flowers. The colors tended to be solid, with beautiful shadings, no strips or pencilling. One which showed up with a quatri-part flower last year has had no growth this year beyond a cluster of small leaf tips which die in succession and are replaced by new leaflets when about 15 centimeters high. When they flowered they were best used as pollen parents. When used as seed parents they had seedlings with a high mortality rate, with the survivors maturing very slowly. When used as pollen parents they had seedlings with no signs of abnormalities, healthy and strong, maturing at a normal rate. There has been no sign of dwarfing in either type of seedlings.

Lycoris. Until last year *Lycoris aurea* refused to set seed. Being a cautious old greybeard by now, I gathered the firm round seeds with skepticism. That lack of enthusiasm was apparently justified because they haven't yet germinated, seven months later. Other species also steadily refuse to set seed: *L. radiata, L. sanguinea, L. squamigera, L. straminea.* Possibly it is the local climate, or possibly they are from sterile stock. The plants are nonetheless welcome in our small yard if they never set any viable seed because their bright splashes of color on tall, graceful scapes add much in late Autumn just when we need them.

Propagation by bulb cuttage. If you will review your old copies of Plant Life you will be able to read much about successful methods of *Amaryllis* propagation by bulb cuttage. It is exacting work. I wouldn't care to have to do it all day long for long periods of time. But used on a few of your best bulbs it will give you a large stock in short order. As is suggested in the articles, practice on some throw-aways before you try a one and only bulb of high value to you. My best results have come with the use of a soil mix on the sandy side in plastic dish pans. In this I work a lot of chopped sphagnum moss. The cut pieces are dusted with my favorite fungicide (A ''favorite'' fungicide, insecticide or fertilizer is like a favorite fishing plug: it worked well once so you keep on trying it). No fertilizer is used until the leaves are up three inches or more. My cutting knife has a very hard blade which takes and holds a sharp edge; it is part of a bonsai tool kit and has a hollow contour from blade back to edge. This winter I plan to try that method on many other Amaryllids. Try it, you'll like it!

SOMETIMES TANTALIZING, THOSE **LYCORIS**

Leonora E. Milstead, *Route 2, Box 261,*
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Gardening in a betwixt-and-between climate such as Oklahoma's presents many possibilities, many difficulties, and many ''perhaps'' situations. For some years now I have been trying to gain a little knowledge of species of the genus *Lycoris*, one of which grows like a weed *(Lycoris radiata,* the Red Radiate Lily) and some of which are doubtful in bloom production and, for me at least, not correctly labeled.

My first bulbs, those of the Red Radiate Lily, were brought back from a friend's place in Louisiana years ago at the Christmas season. I had no idea that they were so hardy, so prolific, and so beautiful; neither did I know that they were *Lycoris radiata.* Now I have them in both sun and shade (the ones among trees bloom before those in full sun), and I often have stray plants come up where I have tossed out small bulbs in re-planting and have not picked up all my toss-outs later.

I have been given some of the fairly recent Japanese imports that bloom earlier than the old southern bulbs, but I am wondering, since they are all of Oriental origin, whether they will not acclimatize themselves to bloom with those so long enjoyed here.

The hardy pink *Lycoris squamigera* was my next acquisition, and now I find that one source says is should be called *Amaryllis belladonna,* while another source says that it is *Amaryllis hallii* and that the true *A. belladonna* is red and a native of Mexico. At any rate, what is usually recognized as *Lycoris squamigera* flourishes here and seems to need separation about every five years. Not so well-known is a similar plant, *L. sprengeri,* which has blue tips. A friend of mine grows this one.

Once I heard about yellow and also white species similar to the red ones, I was eager to try those. That there were pale ones, not white but very beautiful, I was unaware for some time. I still have not seen what I would call a true white *Lycoris.*

The yellow ones, both *L. aurea* and *L. traubii,* performed for me the first year I had them, as I was able to buy them when the foliage had ripened and they were dormant. Since then, I have had flowering only once, on *L. traubii,* not *L. aurea.* Farther south I have seen wonderful foliage in December, but here the leaves make a brave beginning and are nipped by our off-and-on freezes. *Lycoris radiata* is not daunted.

I tried a bulb of *L. aurea* and one of *L. albiflora* on the south of the house but they do poorly there also. No bulb labeled *L. albiflora* has bloomed for me, but one labeled *L. elsiae* has bloomed consistently since I was lucky enough to get it. It is a delight in pale salmon pink. This year I added *L. straminea* and put it into a pot, but I am uncertain as to whether its foliage had ripened when I bought it and none appeared after planting. To my surprise, after *L. straminea* the seller had in parentheis the word *''alba''*.

At the same time that I bought *L. elsiae,* (June 1968) I bought *L. incarnata,* described as white with rose keels. This produced foliage only until 1971, when it sent up a tall bloom stalk, quite worth the wait as far as I am concerned.

One *Lycoris* that is easy to come by and is also a satisfactory bloomer here is *L. sanguinea,* the small orange one. I have almost forgotten it some years until it has reminded me of its existence, and now I have moved it, and its increase, to a better place.

The whole tribe is fascinating although I have yet to see any pale one except *L. elsiae* bloom in my own garden. (I saw *albiflora*—not noticeably different in color—in a friend's garden, one time only.) To date I am still wanting to see a truly white *Lycoris,* if it exists, and to know whether there is any great difference between *alba* and *albiflora.* I am, of course, aware of the fading to creamy color of some.

Meanwhile, I cherish those *Lycoris* that will ripen their foliage here in Oklahoma outdoors.

AMARYLLIS MOSAIC?

E. A. Angell, *25406 Lane St.,*
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In the Amaryllis Year Book of 1970, an article on page 120 is concerned with Mosaic Virus. It states that fans should do away with all virus infected bulbs.

I should like to state that after Mr. Buck wrote the article in the year book of 1964, a man in England wanted to have me ship him some of my bulbs, but the Agricultural Inspector would not give me permission to ship them, as some of mine had what they call Mosaic. He sent some to the Riverside station, and to Oakland, and to Davis, and all said it was Mosaic. I was very disappointed for I had been breeding the most infected plants for 15 years, because I thought it made the leaves look nice.

I wrote to the man in England. He answered immediately stating he bought Mosaic *Amaryllis* all the time, stating it was not Mosaic at all, but only a soil deficiency, and that he had purchased them for years, so I decided to see if he was right.

The University here had at that time their own Disposal Plant, and I could have all the Sludge and water from the plant I wanted. I bought a roll of Vinal black plastic, 8 millimeters thick, 30 x 100, and planted about 1800 bulbs of the infected ones in about 6″ of sludge, and irrigated them from the plant sewage water. In about 6-8 months, there were not over a dozen plants that showed any Mosaic.

My son had a horse, and a lot of manure, so I thought I would try that on about 800 bulbs with the same way on the Vinal plastic, and they also cleared up in the same way in about the same length of time. I had about 4000 bulblets that I planted under the Vinal plastic by plowing a 4″ furrow with a Planet junior hand plow, and pressing it down with the wheelborrow wheel, then cutting a 3″ hole in the plastic with a hatchet, and putting a bulblet right through the hole. I sprinkled right over the plastic with rain bird sprinklers. They have done very well. The plastic has been there 8 years, and I walk on it all the time. It won't stand high heels. Very few of the bulbs show any Mosaic. These bulbs (the 4000) have not been treated with any fertilizer, yet are good. The weeds are almost non-existant except for a few ''Mairs Tails'', and some creeping Spurge (Medicinal Spurge). I do not think White plastic will do the trick. The weeds grow right under it, but not under the black.

All my *Amaryllis* are from Luthur Burbank stock which I purchased from Mr. W. H. Henderson Experimental Gardens near Clovis, Calif., Mr. Burbank's successor. I bought 3 bulbs from him, and grew the seeds to bloom from one of them, but I did not have any real dark red ones, so I sent back to Mr. Henderson for a dark red one, and from the 2 bulbs I have probably grown 100,000 bulblets in 36 years, and have seen, probably, 75,000 bloom. These bulbs last winter took frost down to 17° above zero without being hurt. I now have about 6000 at that place. I also have about 100 bulbs at the same location, that I have crossed with a South American bulb, and have some very fine flowers from them. They didn't freeze either. At the same patch I have several hundred Red-leaf bulbs with different colored flowers.

I see my name on Page 42, as a special award for cut flowers in the 1970 year book, under the heading Southers Calif., official Amaryllis Show for 1969. I sent them about 100 stems, and have sent about the same amount the past 3 or 4 years.

Nov. 20, 1970.

TWO NEW FUNGICIDES

Charles D. Cothran, *1733 N. Gibbs Street,*
Pomona, California 91767

Several years ago two new fungicides of an entirely new class were offered to industrial laboratories for experimental testing. At that time the author was primarily interested in safer and more effective fungicides for citrus fruit, and in that regard both fungicides were astonishingly good. Both effectively controlled blue and green Penicillium molds, and were useful against Botrytis cinerea and Fusarium species. They caused no damage to the fruit and were safe for the user and consumer. Further testing showed these fungicides to have a very broad spectrum of activity, and thereby both became of interest to *Amaryllis* growers and plant hobbyists generally.

The first material to be discussed is manufactured by Merk Chemical Division of Merck and Co. and is called Thiobendazole or TBZ. It is supplied as a wettable powder with 60% active material under the trade name of Mertect 160. It is not soluble in water, has no odor, does not cause dermititis and is relatively non-toxic if swallowed. It is not toxic to plants and bulbs within the range recommended, and as a fungicide is both systemic and contactual.

In the area of bulb diseases it controls Fusarium, Botrytis, Penicillium, and possibly others. Extensive testing has been done on gladiolius, iris, narcissi, and tulips, and very good results have been obtained. No published results are known of tests made on amaryllis.

The Mertect 160 label suggests using 1.5 pounds per 100 gallons of water for dipping harvested bulbs. This is about 1.5 level tablespoons per gallon of water. A wetting agent such as Triton 100 or Vatsol OT is useful in dispersing the powder, but not absolutely necessary.

No mention is made in the literature of spraying or drenching potted bulbs, or bulbs growing in the ground. On other plants, both in greenhouse and outdoor environments, this method has been successful against molds, and has not caused damage to the plant.

The second fungicide is manufactured by E. I. Du Pont du Nemours and Co. and is Called "Benlate", the name being a trademark of du Pont. It was formerly called Fungicide 1991, and most of the early work refers to it by this number. Benlate is said to be systemic, preventive, residual, and curative. It has very low toxicity to plants and animals, and is not known to cause dermititis.

Benlate is suggested for use on bulbs and tubers as a control for Aspergillis, Rhizoctonia, and Fusarium. It is also used to control Botrytis grey mold, and Penicillium mold on carnations, dahlias, and cut flowers.

BRIEF AUTOBIOGRAPHY OF CHARLES D. COTHRAN

I graduated from the University of Washington with a major in chemistry. After graduation I worked for several firms for short intervals doing work other than chemical work. But in 1927 I had an opportunity to work for Brogdex Co., of Pomona as a chemist.

The Brogdex Co. was the originator of the use of wax and fungicides to protect citrus fruit, and has remained the leader in the field up to and including the present time. After about two years I became chief chemist, and later Director of Research and Development. A number of patents were obtained in my name on wax and fungicidal processes, and our processing field at this time includes all varieties of citrus, tomatoes, cantaloupes, bell peppers, sweet potatoes, cucumbers, apples, peaches, and other specialty crops.

The Brogdex Co. started work in Italy in 1934, and I directed the work until 1939 when the war forced us to close down our business. I went to Israel in 1949 and was instrumental in getting packing houses built, and wax and fungicides in use. Later Lebanon, Greece, Tunisia, Morocco, Spain, and Argentina were added to the Brogdex business community.

To use TBZ, Benlate, and Botran required solving some severe technical problems which the Brogdex Laboratory was able to do under my direction. It was done in a manner which continued our leadership in this field. These materials, and our manner of application are very highly regarded by all branches of the fruit industry in California, Florida, and abroad.

I retired two years ago but still remain a consultant to the Brogdex Co. In this capacity I remain in touch with the packing plants which use the Brogdex processes, including Florida and some foreign countries.

PHYTOSAN (CONSAN 20)—DISINFECTANT FOR PLANT VIRUSES

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[We are indebted to Mrs. Emma D. Menninger, of Arcadia, Calif., for sending in the following summary of Dr. Paul C. Cheo's experiment.]

Plant viruses are a threat to many greenhouse crops. They are spread by tools and handling under unsanitary conditions. Effective chemical solutions to disinfect tools and containers without corrosion and poisonous effect is needed. This is a summary of a paper to study the effect of Phytosan (Consau 20) on plant viruses. Tobacco mosaic virus (TMV) is the most stable virus, and it is a common greenhouse problem. Therefore TMV is used entirely for this study.

The airbrush spray method was used for virus inoculation. For each test, at least 14 replications were used. The common strain of Tobacco mosaic virus (TMV) was used, and was purified by means of differential centrifugation.

Different dilutions of Phytosan were prepared. Crude juice from leaves previously infected with TMV was obtained. At active concentrations of 1—640 (311 ppm. or approximately 1/5 oz. Phytosan per gallon of water) dilution of Phytosan, complete inactivation of infections crude juice was obtained.

Based on these tests, Phytosan used at a rate of 1 oz. to 3 gallons of water will inactivate plant virus where the solution contacts the virus. At this strength, Phytosan will inactivate virus on cutting tools, work benches, pots, compost, tags, stakes, hands, and on the plant. Further tests are being conducted to determine whether Phytosan is also systemic.

A complete report of these tests has been submitted to Plant Disease Reporter for publication.

[Editorial Note.—Copy of tests is available from Consan Pacific Inc., P. O. Box 208, Whittier, Calif. 90608.]

GROWING AMARYLLIDS IN NORTH FLORIDA

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The fabulous African Blood Lily, Haemanthus multiflorus is fittingly described as having a ''Beautiful and showy inflorescence forming a perfect ball, with up to 100 flowers coral pink to red, crimson at base, stamens tipped yellow. Most ideal for pot culture.''

This cousin in the Amaryllis family is always a ''people stopper''. When first viewed by the onlooker the normal reaction is ''What is that gorgeous flower?'' ''Where may I get one?''

Haemanthus multiflorus is reported to have originated in Zaire, formerly known as the Republic of Congo. There in the shady reaches of the African forest the bulbs grow and prosper. Aside from their worth as a highly prized flower, they are said to be a favorite food of elephants of the region.

Haemanthus multiflorus plants are of moderately easy culture. They seem to have some sort of clock mechanism built into them which regulates the time of bloom. During the winter they are completely dormant, even losing their roots, but come April or May, a green-brown collar emerges from the center of the bulb, and before long a scape appears to develop into the beautifully rounded flower head.

These bulbs are generally oval in shape, with a very large and thick basal plate from which the roots emerge. They are well suited for growing outside in a warm climate, and just as well suited for pot culture in the north where they should be grown inside, protected from the cold weather. General *Amaryllis* culture is suitable. They like a soil described as being on the "sweet side", and which can be achieved by the addition of ground limestone to the potting mixture.

General culture: Porous soil, not too heavy, to allow good root growth. Place bulbs in pot with most of the bulb outside the soil to allow warm air to promote growth. The basal plate should be well covered by the soil. Bulbs are generally received dry, without roots. Water sufficiently to allow the bulb to settle comfortably in the soil. Thereafter hold the pot in dry, warm storage until spring. In April and May examine the top of the bulb to see if the collar has emerged. When it does, then is the time to start regular watering, once a week. After blooming the flower scape will die down if it has not been pollinated, and the leaves will emerge. If the flower head has been pollinated it will hold and the seed will appear as small rounded "apples", first green, they yellow, and finally red when ready to remove and plant to make individual bulbs.

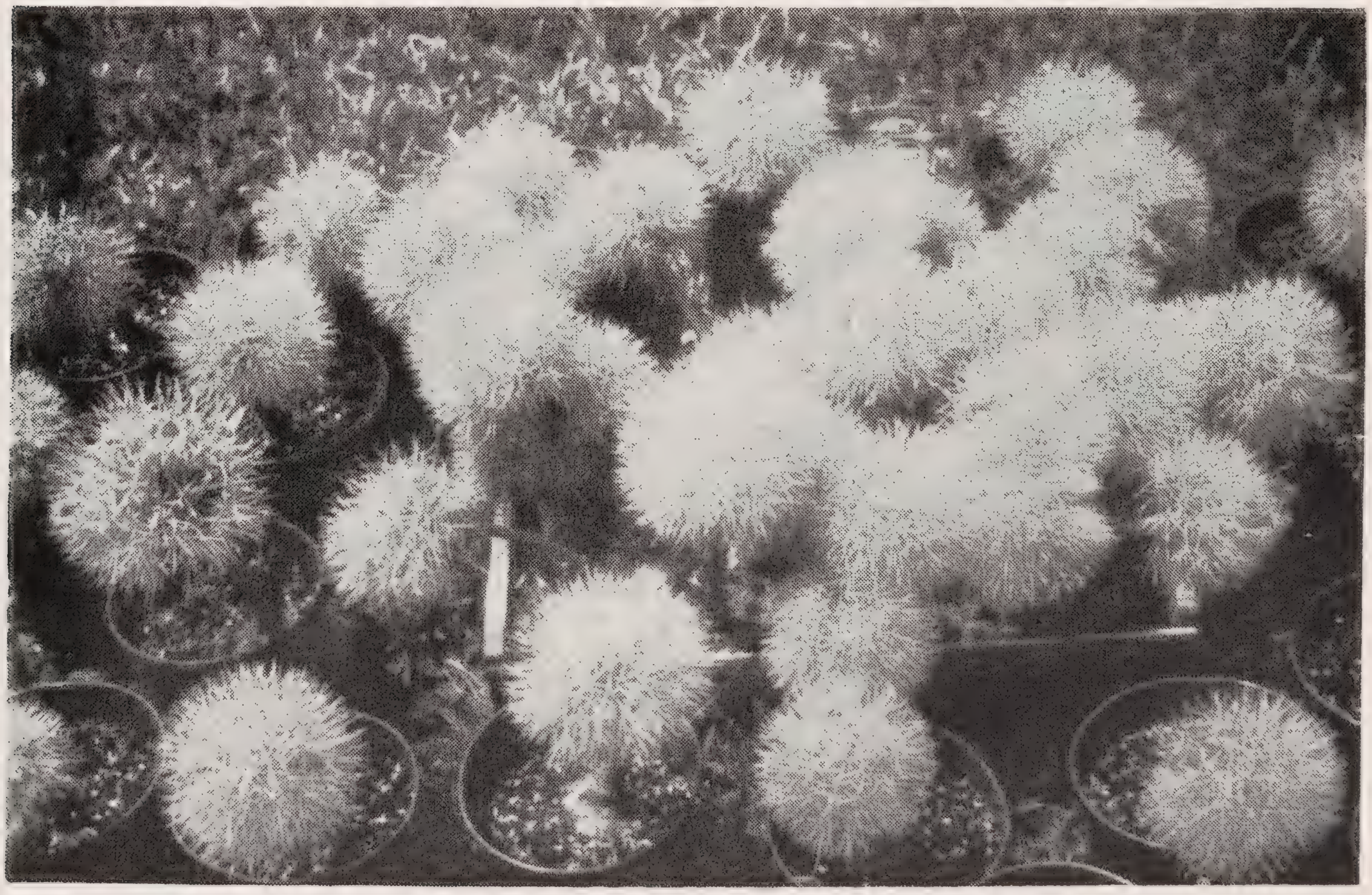

Fig. 23. A group of **Haemanthus multiflorus** Martyn in flower in Northern Florida. Photo by Beckwith D. Smith.

Haemanthus multiflorus may also be propagated by bulb cuttage similar to *Amaryllis* bulb cuttage. They respond very well to this method. Cut the bulbs in small sections, keeping attached a portion of leaf tissue. Place the cuttings in sand and peat, or sand and vermiculite and water well with a solution of soluble fertilizer, say a spoonful to a gallon of water. Do not overwater. Keep in a warm environment and soon you will see a small leaflet emerge from the cut section. Slant the cuttings for better drainage.

You will find growing *Haemanthus multiflorus* most rewarding. Get one or more bulbs (three bulbs in a pot is very effective) and enjoy to the fullest this very beautiful and exotic member of the Amaryllid family.

NERINES IN AUSTRALIA

Lindsay J. Forbes, *59 Union Road,*
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The story by Charles Hardman in the 1972 Year Book prompted me to respond by agreeing with most of his observations. The general context of his article implies that there is a world shortage of nerines and on this point I agree. One needs, however, to analyse this fact and determine the reason why.

Perhaps difficulty with cultivation is a reason. This may be true in the northern hemisphere where, in many instances, green house culture is necessary and one is then immediately confronted with a space problem and also a complicated growth plan which necessitates continual attention. This is not the case in the southern hemisphere as in temperate areas of Australia, conditions are quite suitable for outdoor culture and no attention is needed for years. Bulbs imported by me from England have grown with such zest and have made so many offsets in the first twelve months, that it seems as if the bulbs are singing an ''Ode to Joy'' in celebration of their being released from the bondage of greenhouse culture.

Perhaps the size of the flower is another reason. To me, a flower does not have to be ''The Greatest'' to be admired. I derive as much pleasure in examining, on my knees, a tiny crocus as I do in looking at a huge hybrid flower which has been bred to such a degree that it bears little resemblance to its ancestors. Everyone to their own taste but in the Amaryllid family, where will one find such consistency as displayed by the nerine in strong unright scapes, long lasting flowers and a truly delightful array of colours and forms.

Perhaps lack of knowledge, which creates lack of interest, is another reason. Mr. Hardman suggests that the Nerine Society membership of 235 is good. On the contrary I believe that this is a very poor figure. The latest Nerine Society bulletin shows eight names of Australians as members. Why, with Australia's millions, do only eight people display an interest in nerines. Other countries have more members but I suggest that according to population, the pro rata percentage is no better than Australia's.

Perhaps another reason, and I think the most important one, is the slow degree of multiplication. Professional growers cannot afford to spend their time on such slow growing material and the nerine therefore is not promoted through normal commercial retail outlets. Perhaps the only exception is nerine Bowdenii which is widely grown in Melbourne. This finds its way into chain stores but on the other hand, sales are not necessarily good, as it is a very simple matter to obtain a few bulbs from your next door neighbor. I don’t think anyone has the solution to the quick multiplication of nerine cultivars but he who might find the solution will make a big contribution to horticulture.

Amateurs are usually quite generous in helping their friends, but when one starts with one bulb only, it is years before any offsets are able to be passed on. The conclusion seems to be that nerine growers are in proportion to the supply available and we who enjoy growing them cannot expect any increased interest until supplies are sufficient to find their way to new growers.

I received recently a letter from Holland from a bulb grower who said that he became interested in growing nerines in 1969 and he wondered if I had any bulbs I could let him have. He said that his collection amounted to five named varieties and a few unnamed seedlings. This is a demonstration of how difficult it is to build up a collection, as this grower’s collection, after three years, is still extremely poor. I will certainly let this grower have some bulbs to add to his collection although I can ill afford to part with them as, in most instances, I am still building up my clumps from one bulb.

When I started adding to my collection seven years ago I was already growing the commonly known species—*N. bowdenii, N. flexuosa* alba, *N. fothergilli major* and *N. sarniensis.* With a little difficulty I was able to add ‘Aurora’, ‘Hera’, ‘Afterglow’, *N. pudica,* ‘Gilbert Errey’, and ‘Manselli’.

I then heard of the Nerine Society, joined it, and was able to make contact with other growers here. That important break, together with some imports from Borde Hill Gardens and the Exbury Gardens in England, resulted in my collection growing substantially and I added the following named varieties:—

filifolia
filimentosa
sarniensis var. *corusca*
sarniensis var. *salmonea*
flexuosa var. “excellens”
sarniensis var. *rosea*
‘Coral Queen’
Corcusca Major
‘Splendens’
‘Albatross’
‘Ariel’
‘Beacon’
‘Adela’
‘Lady Havelock Allan’
‘Lady Eleanor Keane’
‘Miss E. Bromley’
‘Diana Olliver’
‘Miss Carrington’
‘Timoshenko’
‘Stephanie’
‘Dunkirk’
‘Adelaide’
‘Queen Mary’
‘Eddy’
‘Rotherside’
‘Grilse’
‘Gaiety’
‘Rushmere Star’
‘Rushmere Victor’
‘Mars’
‘Inchmery Kate’
‘Joan’
‘Solent Swan’
‘Carolside’
‘Plymouth’

'Old Rose'
'Novelty'
'Bridesmaid'
'Carmenata'
'Mrs. Cole'
'October David'
'Fletcherii'
'Mrs. H. J. Elwes'
'Pamela'
'Cardinal'
'Hamilton'
'Blenheim'
'Vestal'
'Margaret Rose'
'Audrey'

This is not as large a collection as other growers must have but it does include most of the recent well known English hybrids and the famous first tetraploid 'Inchmery Kate'. I also have many unnamed seedlings of Australian origin, some of which are of excellent quality and I therefore rate my collection as good by Australian standards.

None of the eight members of the Nerine Society in Australia are professional, although one member does grow the bulbs for the sale of the flowers.

Two of the collections are very large and began by collections being handed down from earlier Australian bulb specialists. Much work has been done on the original collections and much new material has been added. One of these collections goes close to rivaling some of the biggest in England.

From one of these growers I have had some very interesting unnamed hybrids. One which appeals to me very much *is an alledged* seedling, *N. bowdenii* X *Lycoris sprengeri.* It has the robust habit of *N. bowdenii,* never fails to bloom each year and in colour, it is a good lavender. It does not ''blue'' until the flower is ready to wither.

In looking at the overall position there does seem to be an increasing world wide interest in nerines, even though it be slight and I commend all growers to be generous within their own limits, so as not to discourage any newcomer to the ''fan club''.

I hope these notes will prove interesting to nerine growers in the U.S.A., but I must regretfully close on an unhappy note by saying that I do not have any spare bulbs at present.

NERINE COMMITTEE REPORT, 1972

Charles Hardman, *Chairman, Nerine Committee,*
Box 936, Temple City, California 91780

The past year's growing seasons certainly brought its share of surprises.

One of the biggest surprises of all came in the form of a non-event: the lack of adequate rainfall here in Southern California. Total annual rainfall figures as scant as eight and one half inches—and some not even reaching that mark—were common throughout Southern California. It was the driest winter season in a long time.

But if the wet season was notable for its dryness, the current dry season has been remarkable for its wetness. In May, just as the Nerine bulbs were drying off for their summer dormancy, a storm passed through the area and dropped a quarter of an inch of rain. In August, another storm repeated that performance, bringing my back-yard summer rainfall total to half an inch. And we've had three more storms pull their shirt-tails over the Los Angeles Basin this year, scattering sprinkles here and there, and pushing the humidity readings way up into the uncomfortable range. For humans, that is. Growing plants loved it.

Nerines were not supposed to be growing, however. They were supposed to be dormant, and dry. Trying to keep them sufficiently dry to prevent rotting, has presented a challenge at times during the course of this summer. Just as trying to keep them sufficiently moist presented a challenge during their growing period last winter. I've heard it said that Nature tries to achieve a point of balance in all things. Well, She really outdid herself this year.

I've never found that irrigation water—blessing that it is—could do for growing plants all the good things sweet rainwater can do. My Nerines, for instance, did not make the leaf growth I expected of them last year in spite of copious waterings with the hose. They wanted rain, and showed their dissatisfaction over the substitute by pouting with slower growth.

While some of the bulbs did manage to make fair growth and increase, others just sat there, putting forth only a meager effort. They are alive and ready to give the coming winter season a try. But they knew something was amiss during the last one.

How all this will affect their blooming come autumn, is not certain as yet. A wait-and-see attitude serves one well during such times of trial by anticipation.

Nevertheless, the old adage that ''Nothing is so bad that it does not produce a bit of good'' held true during last winter season. If we did not get much of rain, then we likewise did not get much of the frost that nearly always follows a winter rain out here, when the low pressure area passes over and trails in its wake a cold front that sends temperatures plummeting. Our last ''cold'' season was a quite mild one. We did get some frost, and two or three nights when the temperatures went down into the lower twenties. But in former winters, I've seen the temperature plunge clear on down to 16° F. in my own yard during an especially cold pre-dawn hour. And 18° F. has been registered during several.

Now I won't swear to the accuracy of my outdoor thermometer, but the ground was frozen dent-proof to the standard heel test (three sharp jabs with a leather boot heel) on these occasions. (Not that the heel test is itself any more accurate than my thermometer.)

Nevertheless, when the temperature drops below the twenties, what grower of frost-sensitive plants is going to quibble over the detail of a degree or two? In that temperature range, Nerines need plenty of protection. And usually some heat as well. Apparently, 45° F. or thereabouts is the critical range for good flowering. Drop the temperature much below that mark for very long, and the flower bud—which is formed at the same time is the new leaves—suffers damage, and, often, death. This does not occur right away, of course. But keep the bulb thoroughly chilled for several hours, and your chances of losing next season's flowers are very good.

Much more work needs to be done in this area, for it is obvious that critical temperature factors follow somewhat along varietal lines, as do so many other factors. Just as certain varieties increase rapidly while others make large bulbs, we can expect a degree of inbuilt cold-resistance in certain hybrids. And it would be natural to expect this cold-resistance ability in varieties that have the hardier species in their backgrounds, *N. bowdenii* being the one brought to mind immediately. This species and its varieties—and no doubt many of its hybrids as well—do not seem to be affected by low temperatures to anywhere near the same extent as are varieties derived largely from the more cold-sensitive *N. sarniensis.*

There were other surprises during the growing seasons just past. Can you imagine Nerines blooming in May, at the beginning of the dormant season? Six bulbs did just that in the Greenoaks collection of Mrs. Emma Menninger. Three were of the same variety: 'Glacier'. All six of these bulbs had lost their leaves and gave every appearance of having gone off to sleep for the summer. Then they bloomed. Immediately following this anachronistic display of arrogance and caprice, they lapsed into dormancy again.

A potful of the variety 'Ben Hills' produced a spike in my own collection during July, and another in August. These spikes were perfectly formed, though perhaps a few inches taller than usual. The first bloomed during a heat wave which hovered the thermometer somewhere between 95° F. and 105° F. for very nearly the entire blooming period. This spike set no seed, although all florets were pollinated.

The second spike is in the process of blooming now (August 28). Temperatures are a bit cooler at the moment than they were for the first spike. Even so, three of the first florets to open have now matured and dropped off this second spike already, taking the seed capsules with them. Again, each floret was pollinated. 'Ben Hills' has set seed for me in the past, so I'm blaming the excessive heat for its current failure.

The remarkable thing about this performance, is that *the bulbs never went dormant.* They retained green leaves right through the summer, heat and all. Growth did slow down a bit during the blooming of the first bulb when the weather became so warm. Right now, though, the growth rate seems to be accelerating again. The plants show no sign of going dormant at all for this year.

What is more, a bulb of 'Mansellii' is now in the process of sending up its flower spike in spite of the fact that it has never had a period of dormancy this summer either.

What does all this mean? I'm not quite sure. It is for certain, however, that, under the right conditions, some varieties can bloom in the spring rather than holding their buds until autumn. And, too, some can be kept growing right on through the summer to give a very early crop of flowers. Experimenters and lovers of the off-season bloom take note! As for myself, I intend to attempt a follow-through on this interesting tendency with further observations next year.

It has always been amusing to me to notice the way so many members of the Amaryllis family—Nerines included—occasionally lose only the tops of the newest leaves as they go dormant. Then, on re-awakening at the next growth cycle, the bottoms of those old leaves resurrect themselves and come out battle-scarred but eager to get on with the furnishing of whatever help they can provide to the bulb's welfare. That is quite a different slant on dormancy and breaking dormancy than the method used by the Iridaceae, in which a new plant is sent up to grow and produce an entirely new bulb underground. And it seems to occur most frequently with my own Amaryllids when they are hastened into dormancy rather than when they can take their own leisure time about the process.

My seedling Nerines have been potted up recently and are starting to push out tiny new leaves. They are altogether fascinating—as all seedlings are—and provide me with a thrill of anticipation each time I take a peek to see how they're coming along. That's on an average of three times each day. I doubt if the flowers they will subsequently produce can ever provide me with quite the sense of fulfillment just growing them is giving me.

Yet, the goal is to bloom them all out as soon as possible, and, with luck, to find at least one worthy of registration. At that point, though, it becomes a variety, and, as such, it then belongs to the world. For the time being, no one but myself cares about those seedlings, their care, their watering, their fertilizing. It's the thrill of working with life and the satisfaction that comes with helping to create new forms of life that make the step by step chores and tediums of hybridizing worthwhile.

It is a source of contentment mixed with wonder to watch each new leaf as it is formed. (Somehow, Nerine leaves always end up looking too short, even when they're fully developed.) The blue-greens, gray-greens, and bright greens of the leaves, some of the newest with a pencil-thin edging of spicy red, provide color enough in their own right, were the truth known. Such leaves make waiting for the flowers endurable, even exciting.

The Nerine Committee received a communication this year from Mr. Lindsay J. Forbes, whose article on growing Nerines in Australia appears elsewhere in this issue. The down-under continent has a small group of Nerine enthusiasts at the moment. But, if we can judge from Mr. Forbes' article, it is composed of serious and dedicated growers.

Another communication arrived from Mr. Zelimir K. Tvrtkovic Sahin who is located in the Netherlands. This gentleman is currently in the process of building what must surely become the most comprehensive Nerine collection in the world. Mr. Tvrtkovic Sahin has spent a part of this year purchasing stock from several important collections throughout the world. We certainly wish him well in this endeavour. Even a single, truly comprehensive Nerine collection could serve as an important genetic pool for hybridizers. Viewed in this light, contemporary hybridizers and those of the future can be grateful to Mr. Tvrtkovic Sahin for his efforts in this regard.

The GREENOAKS Nerine collection, owned by Mrs. Emma Menninger of Arcadia, is still the only major gathering of Nerine hybrids here in Southern California, or, as far as I have been able to determine, in America. For any individual privileged to see the collection in full bloom, that sight marks the high point of the Nerine season. There are so many to view and admire that it is difficult to determine favorites. However, . . . I doubt if I'll ever forget that one intensely scarlet seedling with the head of fifteen mammoth blooms and buds. The sight was overpowering! I found myself going back to it repeatedly for "just one more look".

White Nerines with their ethereal laciness are among the loveliest flowers in Nature. Hybridizing the white has become a specialty with Mrs. Menninger in recent years. Her article on the subject appears elsewhere in this year book.

The GREENOAKS collection also includes a number of smokies—"blues" to some—which were blooming when I visited last autumn. I've never been much of an admirer of these off-colors. But after seeing these, I'll admit I'm hooked.

Somehow, the pink-, rose-, and coral-tinted varieties remind me of little girls with their hair done up in curls and ribbons. That's not a particularly original comparison perhaps, but there you have it. It's a comparison I like anyway.

There were a great many of these last-mentioned colors on display in the collection. So many, so nearly perfect. Had I been awarding a perfection trophy, it might easily have gone to a pink one, another seedling, which, at the time of my visit, was putting on a show reminiscent of a small Agapanthus: stout stems, full rounded head of bloom, wonderful color. Nothing was lacking. As I say, I'd be hard put to select a favorite.

But, oh! That red seedling. . . .

We start another bloom season in a few weeks. I noticed just the other day that our last shower has brought out a spike already on one of the bulbs of 'Edith Godman'. It would have been preferable to have had it bloom a bit later to permit the cooler weather a chance at helping assure seed set. But we learn to take Nature's help when it's offered.

And we learn to ride out each year as best we can.

1972 DAYLILY REPORT

W. QUINN BUCK, *Chairman, Daylily Committee,*
The American Plant Life Society

Looking back over the 1972 season in my own garden, the most beautiful of the new introductions blooming for the first time was 'Mary Moldovan' (Moldovan) ['Kathleen Elsie Randall'/ ('Summer Splendor' x 'Kum Yin')], particularly outstanding for its perfect form, which made me try to cross it with everything showing deficiencies in form, such as the treated 'Fuchsia Flame' (Hardy), which had intense, clear, sunfast color, and the treated 'Charlemagne' (Moldovan), a good lavender purple in our climate. 'Mary Moldovan' was used as pollen source for such other treated clones as 'Pink Superior' (Fay), still outstanding in the clarity of pink; F63-1 (Fay), a large pink seedling out of 'Beautiful Lady' (Fay), and the beautiful rose pink 'Vivacious' (Munson).

'Chicago Silky' (Marsh) was excellent for first season bloom, showing good form, color, and plant habit, and its blending of colors made it promising as a parent.

Among the new yellows 'Erin Prairie' (Fay) was a greenish shade, with even more green in the throat; it showed amazingly good branching, being rivalled only by the pale, round 'Galena Moon' (Blocher) in this respect. 'Florence Byrd' (Peck) was able to show what fine flowers it can produce, but its performance was obviously not typical this first season here. Mr. Fay's 'Mary Todd' was not displaced by any newer variety as the best performing fine yellow tetraploid in my collection. It was pleasant news from the Convention for 'Mary Todd' to receive the President's Cup, a tardy recognition of this wonderful variety.

'Lusty Lealand' (Peck) in its second season was again the outstanding red, and 'Jock Randall' (Peck) was the premier dark rose blend, as it was last year; both clones were much used with such treated plants as the bronzy-red 'Double Pace', one of the late Robert Baker Wynne's multiflora doubles, which produced seed freely. 'Cherry Cheeks' (Peck), for its equisitely pure dark rose-pink color, was approached only by the treated 'Vivacious' (Munson).

The induced form of 'Frances Fay' (Fay) again was spectacularly beautiful in mass effect, besides being an excellent seed-setter. 'Alison' (Peck) was superb in form and performance among the darker melons.

For color, 'Empress Mei Ling' (Munson) and 'Scarborough Fair' (Munson) were outstanding blends of intense coral and rose. 'Georgica' (Munson) was also good in clear color and plant habit, but its flowers did not open well here.

Among the treated minatures, the wonderful lavender-purple color of 'Little Wart' (Spalding) paled when temperatures rose late in the season; its intense color was still rivalled only by the medium-sized, paler 'Tai Pan' (Moldovan), which is a most outstanding performer for me.

Such new varieties as 'Grape Harvest' (Moldovan); 'Queen of Roses' (Peck); 'Kincraigie' (Peck), and others, could not be judged fairly from first season performances.

One of the best things to be reported from the American Hemerocallis Society Convention in Indianapolis, Ind., this year was the awarding of the Bertrand Farr Medal to Dr. Virginia L. Peck, of Murfreesboro, Tenn., for her outstanding work in tetraploid daylily breeding. She has been one of the most earnest workers using colchicine to broaden our horizons in tetrapliod breeding, and her own developments make this award most deserved. Dr. Peck's new red seedlings in 1972 gave so many finished flowers as to make it difficult for her to see further avenues for progress in this color. Seedlings out of an induced form of 'Catherine Woodbury' (Childs) used with her own seedlings gave a wonderful range of colors from pale pink and lavender to deep purple, many showing great promise. Particularly fine results came from using 'Lusty Lealand' in red crosses, as well as from using 'Jock Randall' in rose and red crosses. The many doubles derived from 'Jock Randall' were delightful surprises, some showing amazingly good color and form.

Steve Moldovan's garden in Avon, Ohio, was full of unbelievable colors and fine forms among the new tetraploid seedings. His siblings 'Puccini' and 'Disraeli' ('King's Cloak' x 'Royal Watermark') were cerise rose wines of most outstanding quality. 'Burmese Moon' ('Heather Green' x 'Jade Bowl') was a pale pastel blend of exceptional merit. 'Camphor Flame' ('Noahs Ark' x 'Empress Mei Ling') was a very superior blend of pink, rose, and coral. From among the lavender seedlings out of the induced 'Catherine Woodbury', the two most outstanding were named 'Concubine' and 'Empress Seal'.

In the Chicago area, Bro. Charles Reckamp at Mission Gardens had many superb new melon seedlings, but there were also new pinks and reds obtained by crossing 'Shell Pink' (Fay) and a red tetraploid with some of his finest melons. His 'Evening Gown' was reported as producing its fine, lovely melon pink flowers for a very long period in the Deep South, and 'Amber Palace' has been called a "Pinnacle" among deep apricot copper melons.

James E. Marsh had many more very fine lavender and purple seedlings, some showing white edgings. In his garden, 'Chicago Thistle', a round, ruffled lavender released in 1972, and 'Chicago Two Bits', a very fine purple tetraploid to be introduced in 1973, were most outstanding performers. Clarence J. Blocher had some amazing new color segregations in his seedlings; he released his 'Galena Star' this fall.

Among the seedlings of Wm. R. Munson, Jr., in Gainesville, Fla., there were many new delights, such as 'Strasbourg' ('Kings Cloak' x 'Scarborough Fair'), a large rosy wine; 'Fugue', a medium large rose pink with circular cream throat; 'Kirishima', a large pastel peach and ivory blend; 'Embassy', a very round raisin wine, incredibly producing three and four spikes per fan; 'Chittagong,' rose magenta to rose peach, with yellow eye washed rose, and carrying up to 50 buds; 'Mountain Violet' ('Kings Cloak' x 'Chicago Regal'), a rich violet purple; 'Ruwenzori', ('Medea' x 'Chicago Regal'), a fantastic blend of lavenders, and edged white; 'Kara Kum', a pastel blend, and its sibling 'Magnifique'—a superbly formed flower—out of 'King's Cloak'; and 'Prussia', the only red seedling used this year at Wimberlyway Gardens, where some 35,000 seed from the new crop were planted this autumn.

Frank Childs had outstanding new seedlings among his diploid whites and the lavenders out of 'Catherine Woodbury'. Dr. Currier McEwen of South Harpeswell, Maine, has found an exceptionally fine yellow among his seedlings, and he is looking for more tetraploid seedlings that can always open well in his cool climate; this quest can be of great value to areas having cool nights such as parts of California.

There has been no news from many of the other breeders, and we regret not being able to give some word of their efforts. All in all, 1972 was a busy and fruitful time for breeders all over the country, and great progress is being made in both tetraploid and diploid breeding.

TETRAPLOID HEMEROCALLIS TO CHINA

HAMILTON P. TRAUB

Under date of August 16, 1972, seeds of the tetraploid daylily species, 2n=44, *Hemerocallis washingtonia* Traub clone 'Golden Ring' (Traub, 1971) were sent to the People of China through the Chinese Ambassador to the United Nations. Seeds of 'Golden Ring' were sent because it sets seeds readily to its own pollen, and thus it can be easily propagated by that means.

We know from the literature that in China the buds of the daylily, the native diploid *Hemerocallis* species, are harvested and used as a delectable fresh or cooked vegetable for use with meats, in soups and salads. The buds may also be dried and sold as a cash crop in China or for export in World trade. The dried product imported into the United States by Chinese immigrants is known under the names, Gum-jum (Golden Needle), or Gum-tsoy (Golden Vegetable).

However, the daylilies grown in China today are native diploid species, 2n=22, and the flowers have rather thin tepalsegs. Since 1949 (see Traub, 1951) in the United States, tetraploid daylilies have been produced. These are included under the species name *Hemerocallis washingtonia,* 2n=44, having flowers with very thick tepalsegs, and these are far superior to the diploids (2n=22) species now used as a vegetable.

GROWING AMARYLLIS FROM SEEDS

Burr Clouette, *701 7th Av., San Diego, Calif. 92101*

In January 1970, I received some *Amaryllis* seeds from Dr. Traub who had in turn received them from Blossfeld in Brasil. There were ten good seeds in each of two packets. One was labeled *Amaryllis* 'Beautiful Lady' x *A. striata crocata,* and the other *A. striata crocata* self.

I germinated both lots by the tap water flotation method. Five good plants were obtained from each lot. The seedlings from each lot were planted in communal 5-inch pots. The potting mixture used was 2/3 Black Magic potting mixture and 1/3 coarse sand (actually Parakeet Gravel and charcoal mixture sold by Harts Mountain) plus a little baked crushed eggshell. I kept the soil moist at all times, and watered with regular strength solution of fish emulsion or dry fertilizer every second or third watering. They grew well. The *A. striata crocata* seedlings started to offset when quite small, and never did get larger than 1-inch in diameter during the entire time, except one seedling.

The 'Beautiful Lady' hybrid seedlings soon crowded the pot and at the end of seven months they were repotted. The largest two (about 1-inch in diam.) in one 6-inch pot, the other three in another 6-inch pot using the same potting mixture already indicated and the same watering procedure. They had slight periods of inactive growth but remained evergreen. The *A. striata crocata* seedlings had to be divided and repotted at the end of about a year. At that time most of the offsets were removed—all bulbs except one were scarcely more than ½-inch in diam. One exception was more robust in all particulars; the bulb was about 1-inch in diam., and leaves much broader than the others.

All seedlings were grown in half daylight sun or more. The pots were against a south facing wall most of the time or a south facing third story window. I have found in my experience with *Amaryllis* that they thrive with warm roots. All my best results have been with pots against a sunny wall, and a light well-drained potting mixture and regular watering and fertilizing.

In the spring of 1971, the 'Beautiful Lady' hybrids were again repotted singly in the potting mixture already indicated in 5-inch pots. They had been in more or less active growth since germination. Repotting did not set them back.

In the fall of 1971, the 'Beautiful Lady' hybrids were dried off and stored for a few months in a dry location. In February, two of the bulbs appeared to show slight sprouting and these were watered and placed in a warm place, where they started growth. They were moved to light. Soon buds shot up and they bloomed in March. The other three made leaf growth and two bloomed in April, and the fifth in May. Thus, they bloomed in two years from seeds.

None of the 'Beautiful Lady' hybrids showed any *A. striata crocata* influence. They were all similar to 'Beautiful Lady', but none were of the same color—slightly different orangy color. One bulb produced two, 2-flowered scapes; three each produced one 2-flowered scape. None of the bulbs was over 1½-inches in diam. All flowers were smaller than 'Beautiful Lady'; all had a nice lacquered sheen and a darker throat.

The outstanding *A. striata crocata* self seedling developed a bulb 1½-inches in diam. and leaves about midway between 'Beautiful Lady' and *A. striata crocata* in width. All were good growers with few offsets, but no blooms as yet. The four other seedlings in the lot produced offsets in great profusion but there was very little increase in size of the bulbs, and no blooms. Perhaps they need less fertilizer and a drier culture than the 'Beautiful Lady' hybrids.

AMARYLLIDS IN PORTUGAL

H. Christianson, *Fabrica de Tintas de Sacavem,*
Sacavem, Portugal

Portugal is one of the native countries of *Narcissus* species, and where also other amaryllids such as *Allium, Leucojum* and *Pancratium* are to be found, all favored by the Mediterranean climate with dry warm summers and wet cooler winters. Because of this climate it is possible to grow here also a wide range of other amaryllids, taking care to water species coming from summer rain countries during the summer months, and planting these in a soil with very good drainage so that they will not get too much moisture during winter.

Still a few have to be kept dry in the winter in order to give them a dormant period; without which some will refuse to flower. In this way it has been possible to grow about 150 different *Amarylidaceae* here in my garden, including the Mediterranean natives and most of the species from South Africa and California where the climate is similar to that of Portugal.

From South America come many amaryllids and in Plant Life one can frequently read about these, which in general are difficult to obtain in Europe. Surely, members of the American Plant Life Society would be interested in exchanging seeds of Amaryllids. I would be most interested in receiving letters from other members interested in making exchanges, not only of seeds, but also of experiences about the growing of the more difficult species. My address is given at the beginning of this brief article.

AMARYLLIDACEAE

Agapanthus: africanus minor - pendulus - umbellatus (+alba), **Allium**: akaka - albopilosum - caeruleum - callimisheriana - libani - moly - multibulbosum - neapolitanum - nigrum - odorum - oreophilum - polyastrum -pseudoflavum - pulchellum - roseum - schoenoprasum - schuberti - siculum sphaerocephalum - triquetrum tuberosum. **Alstroemeria**: aurantiaca - haemantha - hookeri - violacea. **Boophane**: disticha. **Brunsvigia,** appendiculata - gregara - orientalis - radula - rosea (Cape Belladonna). **Calostem-**

ma: luteum - purpurea. **Chlidanthus**: fragrans. **Clivia**: nobilis. **Cooperanthes**: X lancasteri. **Cooperia**: drummondii. **Crinum**: angustifolium - bulbispermum - campanulatum - flaccidum - macowanii - moorei - pedunculatum - Cape Dawn - Powellii. **Cyanella**: capensis. **Cybistetes**: longifolia. **Cyrtanthus**: coccineus - mackenii. **Dichelostemma**: congesta - ida-maia - pulchella. **Elisena**: longipetala. **Eustephia**: jujuyensis. **Galanthus**: plicatus (Ophelia + Washam). **Habranthus**: andersoni (+aurea F) - brachyandrus - pratensis - robustus. **Haemanthus**: albiflos - coccineus - katherinae - magnificus - multiflorus. **Hieronymiella**: childanthoides. Amaryllis; (syn. Hippeastrum); aulicum - bagnoldi - johnsonii. **Hymenocallis**: amancaes - harrisiana - ovata - Advance.

Leucojum: aestivum - autumnale - roseum - trichophyllum. **Lycoris**: aurea - incarnata - radiata - sanguinea - squamigera. **Narcissus**: **Aurelia**: broussonetii. **Hermione**: papyraceus. **Jonquilla**: fernandesii - gaditanus - wilkommia. **Apodanthae**: calcicola - rupicola - scaberolus - waterii. **Ganymedes**: triandrus cernuus. **Bulbocodium**: bulbocodium (graellsif +nivalis+ serotinus) - cantabricus (clusii+foliosus+monophyllus). **Pseudonarcissus**: asturiensis - hispanicus - minor - nevadensis - obvallaris - pseudonarcissus (+nobilis). **Nerine**: "alba" - bowdenii - crispa - duparquetiana - filifolia - flexuosa alba - krigeri - masonorum - sarniensis corusca major - undulata. **Pancrantium**: maritimum. **Rhodophiala** bifida. **Sprekelia**: formosissima **Sternbergia**: fischeriana - graeca - lutea - macrantha. **Tapeinanthus**: humilis. **Urceolina**: peruviana. **Vargaria**: parviflora. **Vallota**: speciosa. **Zephyranthes**: atamasco - candida - citrina - clintiae - grandiflora - lindleyana - pedunculata - sulphorea - verecunda.

In addition to Mr. Christianson's large plant collection includes various species of **Bessera**, **Bloomeria**, **Leucocoryne**, **Brodiaea**, **Tristagma** (Ipheion), **Tulbaghia**, **Triteleia**, **Milla**, and **Agavaceae**, **Iridaceae**, **Liliaceae**, and **Orchidaceae**.

PLANT LIFE LIBRARY—continued from page 52.

PHYSICAL EDAPHOLOGY, by Sterling A. Taylor and Gaylen L. Ashcroft. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. xiii + 533. Illus. $17.50. Subtitled, The Physics of Irrigated and Non-irrigated Soils, this attractive new book on the latest scientific innovations and their application to soil-water-plant relationships will fill a serious need in the field of soil science, including irrigation science. The subject is developed under the following headings,—foundations of irrigation science; climatic factors; evapotranspiration; physical properties of water; the colloidal system; soil solids; energy relations, movement and measurement of soil water; water retention and flow in soils; soil structure and aeration; temperature, irrigation and maximum production; irrigation under adverse conditions; and irrigation methods. Very highly recommended.

FUNDAMENTALS OF PLANT PATHOLOGY, by Daniel A. Roberts and Carl W. Boothroyd. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. xii + 402. Illus. $15.00. This attractive, easily readable book was written for the "Fully 90 percent of the 4000-odd students who take college courses in plant pathology every year and who are undergraduates studying the subject for the first and last time, as well as for those who decide to undertake a career in this field." The subject is presented in two parts: (1) the theory of plant pathology, and (2) plant pathology in practice. There are two useful indicies: (a) techniques for diagnosis of plant diseases, and (b) use of the literature of plant pathology. Very highly recommended.

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EDITED BY
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HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California 92037

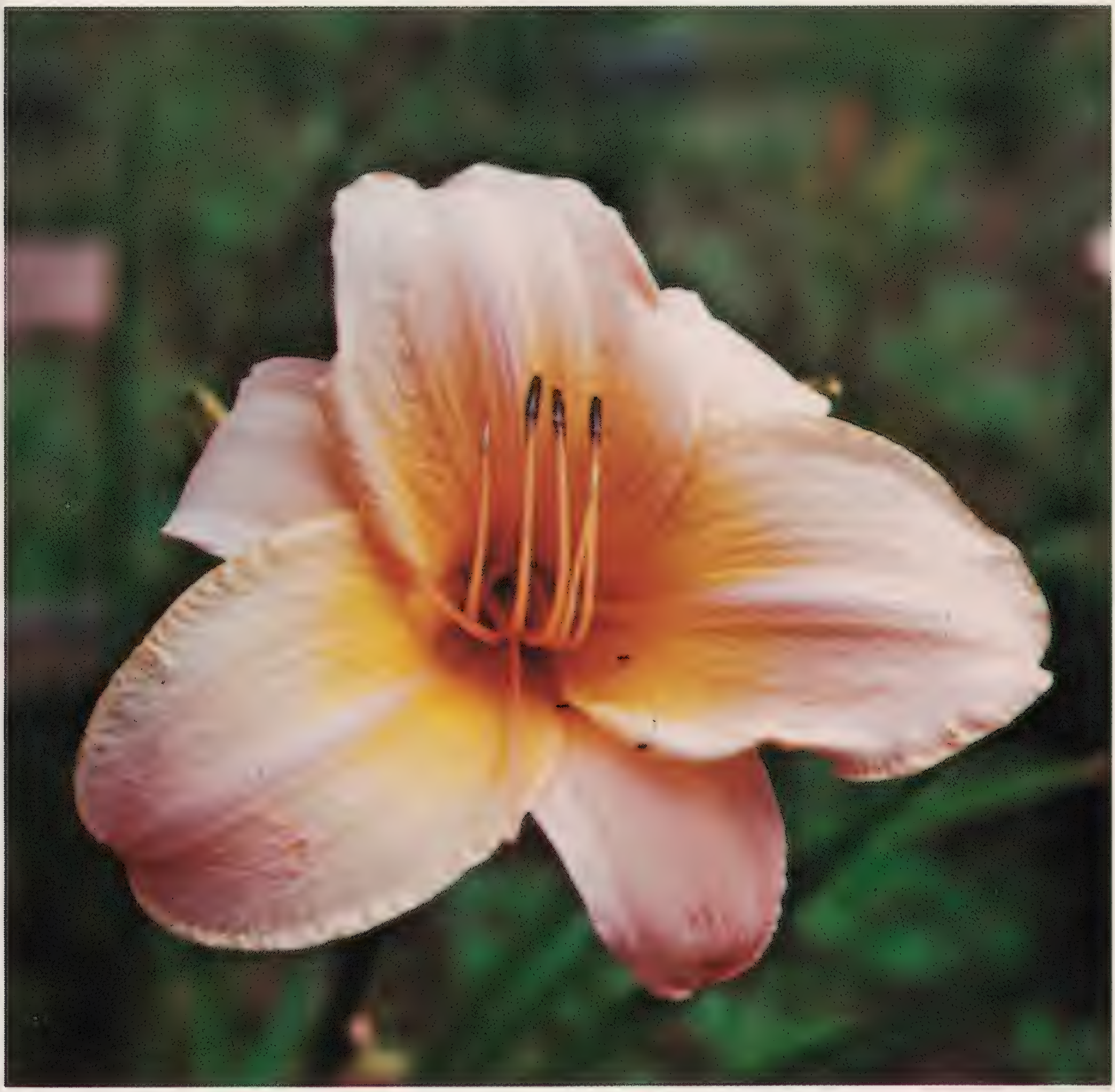
NEW PECK TETRAPLOID DAYLILIES, shown in color in the following insert; through the kind permission of Mrs. Arthur W. Parry; Drs. Richard C. and Virginia L. Peck; the Hemerocallis Journal; and the Southern California Hemerocallis and Amaryllis Society, the sponsoring organization, we present the color plates of four new outstanding originations in **Hemerocallis washingtonia** Traub, the tetraploid species. Our debt to the above named persons and organizations is hereby gratefully acknowledged.

'Queen Eleanor' (Peck, 1967). Photo by Mrs. Arthur W. Parry. Flowers delicate creamy pink on opening, deepening to a glowing, diamond dusted shell pink in the sun; edges of segs gold-colored, ruffled, midribs lavender; throat green; recurrent blooming; fertile both ways; (Wood Sdlg x 'Crestwood Ann').

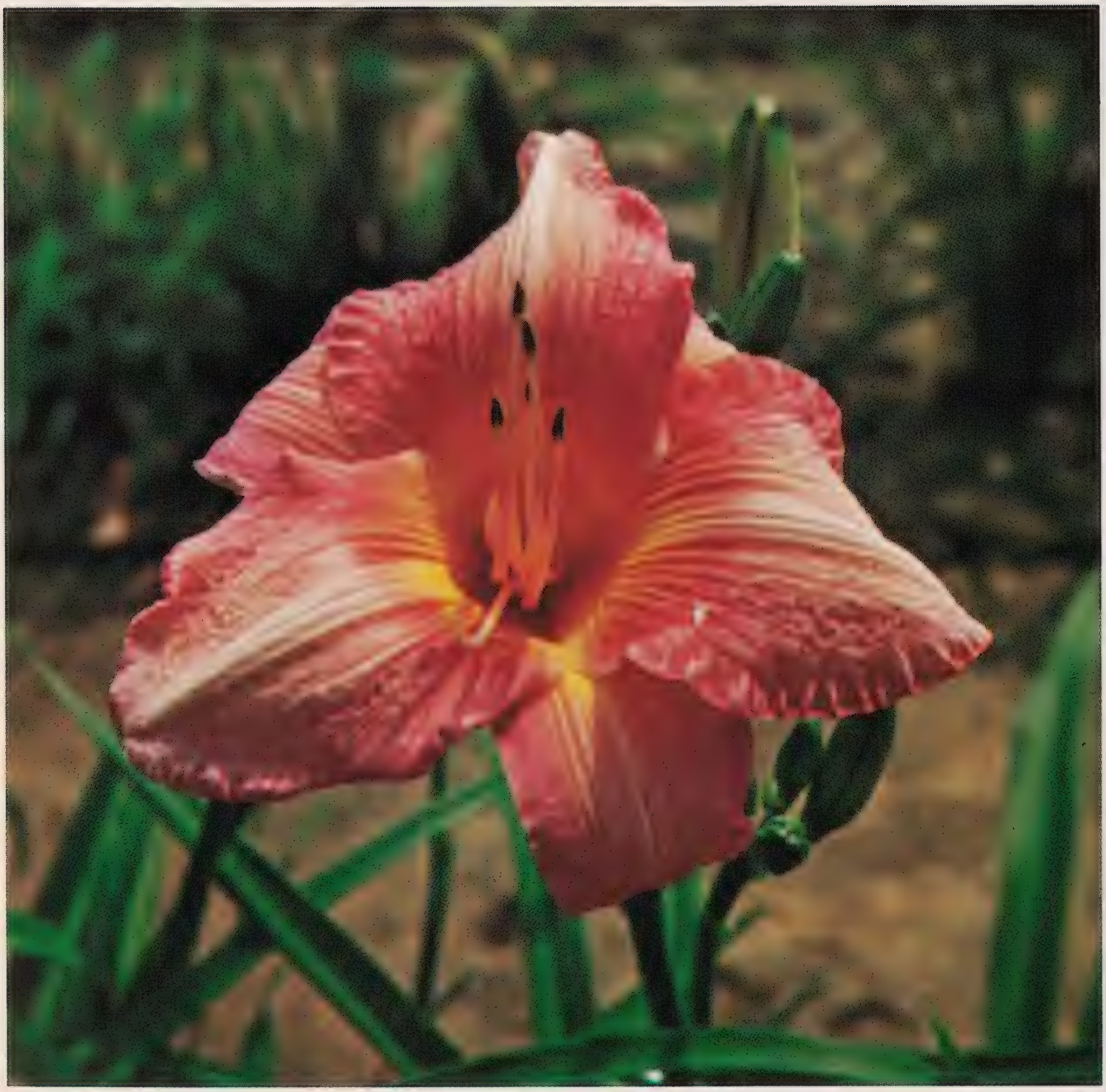
'Gypsy Laddie' (Peck, 1969). Photo by Dr. Virginia L. Peck. Flowers rose pink, deeper rose red veining on segs, and edges, slightly banded rose, throat tangerine-colored. Fertile both ways; recurrent blooming; ('Singalong x Sdlg).

'Queen the Roses' (Peck, 1972). Photo by Dr. Virginia L. Peck. Flowers of a very deep, vibrant rose with lavender tones; petsegs veined deeper rose, setsegs mauve with deeper rose veining; throat apricot-colored; segs ruffled and crimped. Recurrent blooming. (T2-34-67 x T12-65)

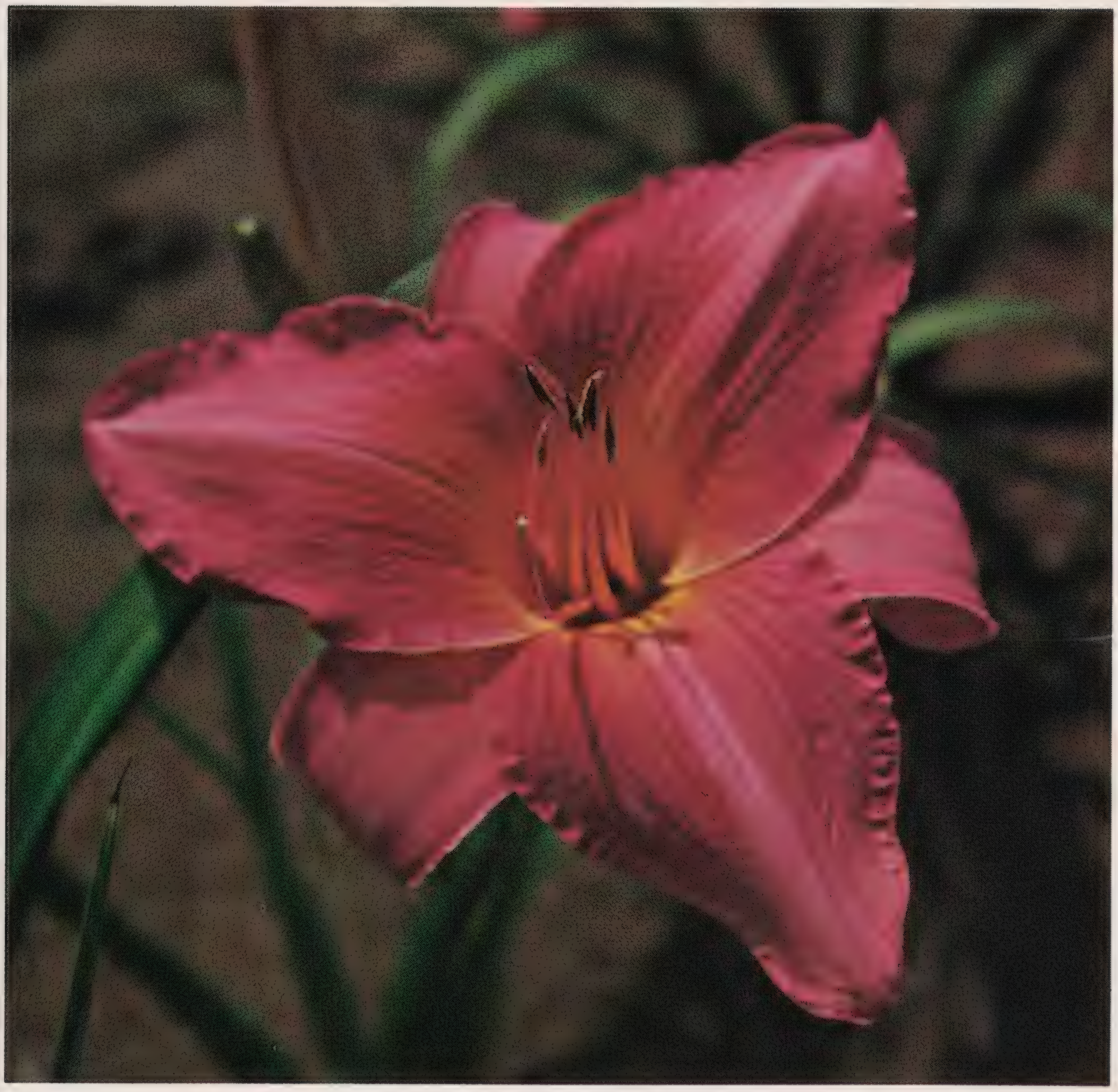
'Someday Maybe' (Peck, 1972). Photo by Dr. Virginia L. Peck. Flowers the color of "crushed strawberries dusted with gold", setsegs strawberry pink, petsegs lighter pink; deep flamingo-colored throat shades out into the pink segs. (T2-34-67 x T12-65)



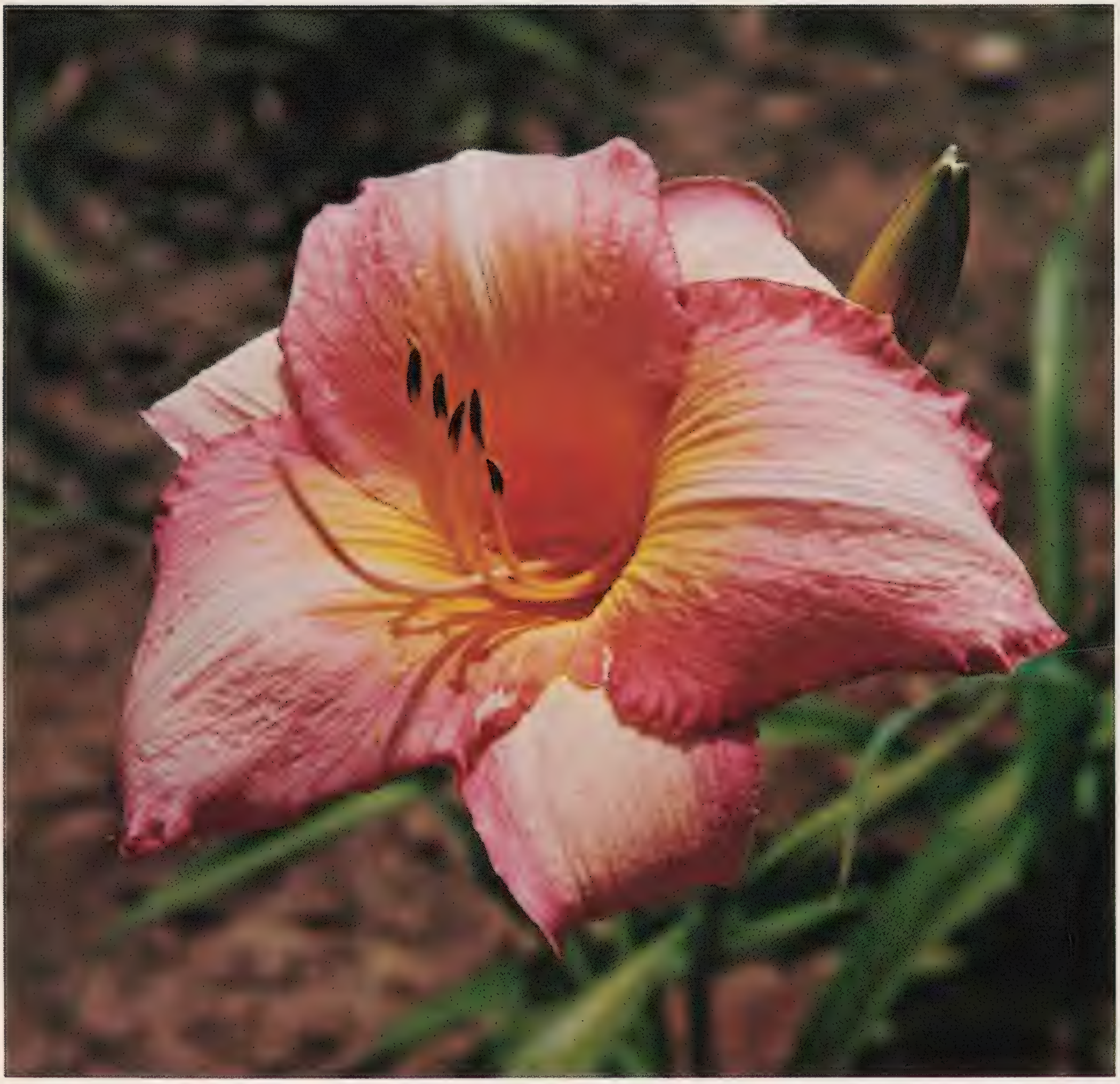
QUEEN ELEANOR (Peck)



GYPSY LADDIE (Peck)



QUEEN OF ROSES (Peck)



SOMEDAY MAYBE (Peck)

THE SECOND DECADE OF **HEMEROCALLIS WASHINGTONIA** JAN. 1, 1959—DEC. 31, 1968 *

Hamilton P. Traub, W. Quinn Buck and Hubert C. Lloyd

ABSTRACT

The development of the colchicine-induced tetraploid species, **Hemerocallis washingtonia** Traub (1951) under cultivation is detailed for the second decade, 1959—1968.

I. INTRODUCTION

The readers are referred to the first report published in PLANT LIFE (Traub, 1959, 1960) which covered the first 10 years of *Hemerocallis washingtonia* Traub, 1949 through 1958. This report was also published in the Hemerocallis Journal (Traub, 1960, 1963).

Hemerocallis washingtonia Traub (1951) is *the first named and published colchicine-induced tetraploid plant species, and is thus unique.* From the first it was planned to publish reports of the species under cultivation at ten year intervals (decades) so as to preserve a record of its development. It was also planned, if possible, to naturalize the species in Eastern Asia, the native home of the diploid *Hemerocallis* species, in order to observe its development in the wild in competition with the native species. However, the political conditions in Eastern Asia were unfavorable for such an undertaking during the first and second decades. It is hoped that such studies can be undertaken in the future.

The outlook on *Hemerocallis washingtonia* since the 1950's has changed radically. When the senior author offered a first progress report to the newly organized publication of the Hemerocallis Society, it was refused and returned so deep was the disbelief in its future. The late E. J. Kraus (1885-1960) stated flatly that the future of hybrid *Hemerocallis* was not in the direction of tetraploids. However, even towards the end of the first decade, 1949-1958, some recruits were enlisted as indicated in Table 1, showing that seven named clones had been introduced by three hybridizers. This, however is not a true index since a number of other outstanding clones had been selected but had not been formally introduced and these technically belong in the second decade and are listed in Table 2, particularly clones named and introduced during the transition period, 1959-1961, including 'Big Brassy', 'Billy Budd', 'Cabrillo', 'Canary Butterfly', 'Captain Reid', 'Crestwood', 'Crestwood Ann', 'Crestwood Bicolor', 'Crestwood Evening', 'Crestwood Rose', 'Doctor Whitaker', 'Elizabeth Traub', 'Giordano Bruno', 'Lemon Beauty', 'Lucia', 'Lucretius', 'Madrid', 'Magdalena Luethi', 'Ophelia', 'Pacific One', 'Pacific Two', 'Peter Cooper', 'Purple

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* This is a cooperative paper; the first two authors are responsible for the text; Mr. Lloyd has prepared the tables of clones.

Premier', 'Ralph Cornell', 'Reverend Traub', 'Salmon Orchid', 'Sue Booth', 'Tetra Arthustar', 'Tetra Aurantorosea', 'Tetra Blossom', 'Tetra Carmine', 'Tetra Elaine', 'Tetra Elyandre', 'Tetra MacArthur', 'Tetra Prima Donna', 'Tetra Rose', 'Tetra Yandre', 'Tetra Yandrestar', 'Traub Violetta', 'White Prelude' and 'Wyndham Haward'.

Now (1968) at the end of the second decade, the interest in the species had greatly increased and many indeed had jumped on the band wagon (See table 2). It is thus incredible that when a daylily handbook (Darrow & Meyer, eds. 1968) was published at the end of the second decade of the species, *Hemerocallis washingtonia* was not recognized, and the plants included in it were lumped with diploid *Hemerocallis* hybrids as tetraploids. For any remaining doubting thomases, the basis of the species is here restated.

First, it should be noted that various other recognized plant species exist only as cultivated plants, including Amerindian Corn or Maize, *Zea mays* L., Polish Wheat, *Triticum polonicum* L., Durum Wheat, *T. durum* Desf., English Wheat, *T. turgidum* L., Grapefruit, *Citrus paradisi* Macf., and many others. Thus species restricted to cultivated plants are not unusual, but *Hemerocallis washingtonia* Traub is the *first named colchicine-induced* plant species.

In *Hemerocallis* L., under natural conditions, only diploids had been evolved over long periods of geological time. A few sterile triploids had appeared in the wild but these were dead-end individuals that could not reproduce their kind. When tetraploids were produced under laboratory conditions by means of colchicine poisoning, fertile offspring could be obtained from certain individuals and these became the beginning of an evolving interbreeding line *which would not intercross with the diploid species.* As still other diploids were tetraploidized, the gene pool was further increased and enriched. Such a line is a species whether it originates under natural conditions or artificially in the laboratory. Thus, such a species cannot be lumped as tetraploids with the diploid species and has to be recognized as a valid species in its own right.

By the end of the first decade, as shown in Table 1. *Hemerocallis washingtonia* was definitely established, with populations in a number of gardens in the United States, numbering in the thousands of individual plants. Seven outstanding individual selections had been named and introduced and 41 had been selected but had not been introduced; all of these were propagated as clones. Thus, a thriving cultivated species was being maintained.

TABLE 1. Catalog of named clones of **Hemerocallis washingtonia** Traub introduced during the first decade, Jan. 1, 1949—Dec. 31, 1958.

Breeders; W. Quinn Buck (California); Robert Schreiner (Minnesota; later Oregon); and Hamilton P. Traub (Maryland; later California).

A number of clones (41 in number) originated up to 1958, but not formally named until 1959-61 (see text) technically belong in the second decade, and are listed in Table 2.

'Brilliant Glow' (Schreiner, 1951), yellow orange self; first bloomed in 1947.

'Tetra Apricot' (Traub, 1951), apricot colored.

'Tetra Kanapaha' (Buck, 1949), Jour. Cal. Hort. Soc.; raspberry self.

'Tetra Peach' (Traub, 1951), peach colored.

'Tetra Rosalind' (Traub, 1953), pastel pink.

'Tetra Soudan' (Buck, 1949), Jour. Cal. Hort. Soc.; yellow self.

'Tetra Starzynski' (Traub, 1949), orange red, medium, self; the nomenclatural type of **Hemerocallis washingtonia** Traub.

II. THE SECOND DECADE OF HEMEROCALLIS WASHINGTONIA, 1958—1969.

As already indicated, at the beginning of the second decade, there was a definite swing in favor of tetraploid daylilies as represented by *Hemerocallis washingtonia.* This swing gained momentum during the following ten years as a number of determined workers made contributions in this field. Especially to be noted are papers on (a) genetics, (b) improvement in the methods for tetraploidizing, (c) the utilization of these methods for the enrichment of the tetraploid gene pool, and (d) the increase in the number of workers engaged primarily in breeding tetraploid daylilies. These developments will be briefly reviewed. An attempt was made to gain first hand information to supplement published reports. If there are any inadvertent omissions, these can be corrected by a supplementary note in the next issue of the PLANT LIFE.

(a) Genetics

Various preliminary studies in genetics have appeared since 1958 concerning inheritance in *Hemerocallis washingtonia.*

Traub, Bohn & Whitaker (1968) on the basis of preliminary data conclude tentatively that only the full recessive of ''melon'' flower color exhibits the ''melon'' phenotype, and suggest a method for testing this hypothesis.

Flory & Phillips (1968) report that in less than 1% of the slow-growing delayed-flowering seedlings that appear when tetraploids are crossed, called ''static dwarfs'', the loss or gain of chromosomes and perhaps particular chromosomes, would seem to be ultimately responsible for the abnormal growth habits of the plants studied. In this connection, it should be noted that new aneuploid *Hemerocallis* species, with a lesser or greater than the euploid number of chromosomes, $2n = 40, 42, 46$, could be established. These might not intercross with the diploids, $2n=22$ or the tetraploids, $2n=44$.

According to Shults (1968) on the basis of preliminary results with seeds of diploids, the optimum x-ray dosage for maximum potential mutations in seeds are 3,000, 4,000 and 5,000 roentgens. Similar experiments with seeds of tetraploids remain to be carried out. However, it might be good practice to use diploids in such experiments, and then tetraploidize any individuals showing desired mutations. Although some progress has been made toward a pure white daylily, this goal has not as yet been reached. It is suggested that the use of x-rays and other radiation treatments may be utilized in treating seeds of near white diploid daylilies in attempts to obtain white-flowering individuals, It is possible that the complement 2n=22 might be easier to modify than the 2n=44 complement. Once diploid white-flowering individuals have been obtained, these could be tetraploidized and the latter used in further breeding. It is hoped that some one will follow up this lead. Perhaps, also other desirable characters could be obtained as by-products, such as longer lasting flowers.

A heritable defect in *Hemerocallis* named ''stamen-embracing petepalsegs'' (Traub, 1968) has been reported. This can be minimized by making crosses with normally-flowering plants followed by selection of non-affected seedlings among the progeny.

(b) METHODS FOR TETRAPLODIZING

The classical methods for inducing polyploidy in daylilies by means of colchicine treatment in daylilies have been reported during the first decade of *Hemerocallis washingtonia.* Schreiner (1951), Buck (1949) and Traub (1949, 1951), who all began their work in the 1940's, reported on such techniques, giving particulars about procedure. The initial successes in time were recognized by others and the classical techniques were used as the basis for further progress in this field during the second decade of *Hemerocallis washingtonia.* These will be briefly reviewed here.

The publication in 1961 of the Griesbach-Fay-Horsfall method for inducing polyploidy in newly germinated *Hemerocallis* seedlings was a major new technical advance since it was so clearly worked out and described as to be useful even to the amateur. R. A. Griesbach in 1953, under the direction of Professor Paul Voth at the University of Chicago, began a series of tests to study concentrations of colchicine solutions to be used, duration of treatment, stage of development of the seedlings, using the Traub (1951) report as a basis for his tests. These experiments led to the treatment in the early spring of 1955 of 5000 seedlings, which were barely submerged for 12 hours in a 0.05% solution of colchicine, then washed in running water for four hours, and immediately planted just at the surface of flats of loose soil. Approximately 1000 seedlings survived the treatment and were set out in the Fay fields in Northbrook, Illinois in the spring of 1956; of this number about 125 outwardly showed characteristics of polyploidy. Out of this group were selected the clones later named 'Crestwood Evening' and 'Crestwood Bicolor'. Large batches of seedlings of selected Fay crosses were treated in 1957, 1958, and 1959, and for some years thereafter.

The paper describes pre-treatment and germination of seed and pictures very clearly the exact recommended stage for treating the seedlings; it emphasizes the need for washing the treated seedlings before planting.

The next landmark technique in polyploidizing *Hemerocallis* came with the publication of the Arisumi method; because of its much easier accomplishment than the earlier Buck (1949) technique reported in a brief note in 1949, Dr. Arisumi's method has been used widely and very successfully by some of our hardest working breeders to be enumerated later. The Arisumi method cut off the entire top about ½ inch above the crown; the leaf tissue was then hollowed out to about ¼ inch above the crown, forming a depression for holding the 0.2% colchicine solution. Careful and specific information on the preparation of the vigorously growing plant, the treatment, and the interpretation of results are all discussed in this paper.

Dr. Virginia L. Peck began experimenting with inducing tetraploidy in daylilies as early as 1958 and 1959, when small ramets were treated in various ways. In 1960 she began treating germinating seedlings by the Griesbach-Fay-Horsfall method, which she modified in 1962 by prolonging the immersion of the germinating seedlings, just prior to shoot emergence, to 24 to 48 hours, instead of 12, getting thereby a lower survival rate, but with a much higher percentage of affected seedlings. Much work went into the winter greenhouse care and growing of the treated seedlings, and this experience Dr. Peck described. A major contribution of the Peck work was in identifying and evaluating polyploidy in the treated material by measuring stomate and pollen grain sizes and interpreting results. By 1963 there were 3000 treated seedlings in the Peck fields, and using all of these plants Dr. Peck made comprehensive breeding studies in the use of chimeras and complete tetraploids.

Dr. Peck was one of the first to begin using the Arisumi method for treating clonal material, and in this she exhibited the same energy and devotion as in previous experimenting. During the winter the greenhouse has had as many plants crowded in for treatment as possible. This work has been reported to several of the scientific seminars of the national conventions of the American Hemerocallis Society by Dr. Peck and her husband, Dr. Richard C. Peck, who has given unlimited help and encouragement in all projects. These years of work have resulted in the production of many important and beautiful named varieties of tetraploids now available.

Dr. W. H. Lachman in 1968 presented an extremely valuable simple way of treating *Hemerocallis* seedlings by a modification of the Traub (1951) method of soaking small ramets: Seedlings about six inches tall were placed in beakers of 0.025% to 0.03% colchicine solution for 5—7 days, at room temperature, then washed and planted out in the open ground. This method gave a very much better survival rate than when newly germinated seedlings were treated, and it gave 5—10% affected adult plants.

The latest new technique for inducing polyploidy in *Hemerocallis* to be published in this second decade of the tetraploid daylilies was the injection method for treating spikes worked out by W. Quinn Buck (1968, 1969) in experiments begun in the early 1950's. By 1955 it was clear that this was a very useful short-cut to getting tetraploid pollen from desirable diploids for use on fertile tetraploids already developed, which could serve as pod parents. The mechanics of the procedure were outlined, and the need to reduce the concentration of the colchicine solution to about 0.03% was pointed out. There have been reports of wide discussion and use of the method, but only two workers have communicated their results to the writers.

A careful study of the use of measurements of guard cells and the pollen grains in identifying chimeras among colchicine-treated seedlings by Nicholas C. Arguimbau in 1967 should be noted because it clarifies certain problems of interpreting these measurements.

A simple method for studying stomatets as indicators of ploidy in *Hemerocallis* was presented by W. H. Lachman.

(c) Increasing the Gene Pool, and Breeding

Two types of activity have to be distinguished, (1) polyploidizing to increase the existing gene pool of the tetraploid species, *Hemerocallis washingtonia,* as detailed in the preceding section, and (2) utilization of the available tetraploids of the cumulative gene pool in breeding.

Among those who were active in increasing the gene pool by colchicine treatment during the first decade of *Hemerocallis washingtonia,* Buck and Traub have continued in breeding tetraploids during the second decade. Most of the other workers in techniques have also made contributions in the field of breeding tetraploids using the cumulative gene pool. Still others, not engaged in devising techniques, make use of the ever enlarging tetraploid gene pool in their breeding operations. Traub now has an array of near whites, yellows, oranges, pumpkin, large-flowering ''melons'', pinks, reds and purples. Buck has had similar results and has a wide range of colors through purple, red, pink, melon, yellow and orange.

Among the more productive of tetraploid breeders in the Chicago area is Bro. Charles Reckamp, S.V.D.,who began working with tetraploids at Mission Gardens shortly after the Fay-Griesbach experiments were initiated. Bro. Daniel Yunck, S.V.D., did the actual treating of germinating seedlings in the laboratory for Bro. Charles, using the Griesbach-Fay-Horsfall method. These seedlings, crossed with the Crestwood Series and other available tetraploids, gave Bro. Charles the foundation stock for his marvelous melons and light yellows. By 1967 and 1968 he had raised many seedlings, including some of the finest named tetraploid clones in these two groups, and he was beginnig to have a few pinks.

James E. Marsh, of Chicago, using seed from crosses of his highly successful diploid lines and including some 400 seed of the cross, 'Prairie Thistle' x 'Lavender Flight', in March of 1965 germinated and treated 3000 seedlings by the Griesbach-Fay-Horsfall method; the 300 survivors were grown under lights in the Marsh basement until late spring when they were planted out in the garden. The first of these bloomed in 1966, and the last of this batch bloomed as late as 1968, giving him some important tetraploid breeding material in the purples and lavenders, such as the chimeric TR 67-90, which later gave a number of the Marsh named varieties. Other batches of 3000 seedlings were treated in 1966 and 1967, with about 300 survivors from each, giving him a particular advantage in the purples. After those years Mr. Marsh concentrated on germinating the seed of his tetraploid crosses under lights.

Orville W. Fay, in summarizing a decade of work with tetraploid daylilies, in 1964 reported having treated an estimated 25,000 germinating seedlings in that period. 1959 was his first really successful year in flowering induced tetraploid seedlings; this was the year when 'Crestwood Ann' first bloomed, and this matriarch of tetraploids has been of great importance ever since. By 1964 Mr. Fay had tetraploids in every color, being limited only in numbers of reds and lavenders.

Dr. R. A. Griesbach for a number of years grew many seedlings of his own crosses in his home garden in Chicago, having begun with much material from Professor Paul Voth's lines. By 1966 he had named 'Arriba', a large green-throated red, and in 1967 Mrs. W. T. Hardy bought a selected group of his tetraploid seedlings, which she released in 1968.

Nathan Rudolph, of Chicago, almost as soon as the Crestwood Series became available, began combining the Fay clones with the Traub tetraploids, and by 1968 he had released several of his own varieties.

C. J. Blocher, of Wheaton, Illinois, began intensive breeding of the various tetraploid lines in his Chicago area in the early 1960's. By 1968 he was beginning to see promising seedlings in his chosen colors of red, rose, pink, lavender, and purple.

Mr. Walter Jablonski, of Merrillville, Indiana, experimented with treating spikes by his own modification of the method (by using hypodermic syringes) immediately after the appearance of the Buck article, and from this first season's work he raised 200 tetraploid seedlings, some of which gave very beautifully formed flowers. Being able to get and use tetraploid pollen from treated spikes of selected diploids saved several years, he reported. Much experimenting with various other methods of tetraploidizing was begun and has been continued, with excellent results.

Steve Moldovan, of Avon, Ohio, must be included in this group of Chicago workers because Moldovan's Gardens for some years released the new Fay tetraploids, as well as Bro. Charles's new introductions, which it still lists each year. In addition, Mr. Moldovan treated seed and plants for a number of years, all of this giving him an extremely rich bank of material from which he has begun to get important color breaks and segregations.

In the Northeast, Dr. Currier McEwen 1972, of South Harpswell, Me., began treating sprouted daylily seed in March of 1961 following a visit to Mr. Fay at Iris time in the previous year. Over the years since, some 12,000—15,000 seedlings have been treated by him. His first induced Chimera bloomed in 1963, but he did not have his own tetraploid crosses blooming until 1966. In his extensive breeding program he has been working to get hardy clones that will open well in his cool climate; he has been interested in greens, near-whites, purples, and green-throated reds, as well as doubles.

In Massachusetts, Lawrence Arguimbau (1967) and his son Nicholas have been working with tetraploids since 1963 and have had moderate success in tetraploidizing.

W. H. Lachman, of Amherst, Mass., had had some very favorable results with his tetraploid breeding program.

In the South, Frederick M. Benzinger (1966, 1972) of Ruckersville, Va., began treating diploid plants in October, 1964, using the Traub (1951) method and an original method of injecting the whole crown with a hypodermic needle. This injection method was abandoned in favor of Dr. Traub's technique. Mr. Benzinger worked out methods of propagation so that he could isolate affected tissue of chimeras. He also raised diploids from seed treated with X-rays and Cobalt 60, later successfully tetraploidizing these clones and using them in breeding. In his large commercial greenhouses Mr. Benzinger has carried on his very extensive programs even in winter, using not only his own induced material, but also the Traub clones and the Arisumi induced clones from the United States Department of Agriculture, and named tetraploid clones from other breeders. He has been making progress in shortening the time from seed to blooming, in quality, form, and ruffling of flowers, in reblooming tendencies, in colors such as blue, which he has in his acid soil, and in a number of other directions. He anticipates flowering many important seedlings from all the stock at hand. A number of Benzinger tetraploids have been named and released.

The work of R. W. Munson, Jr. of Gainesville, Florida, has been particularly noteworthy because of the new colors that he has gotten in certain fine tetraploid clones. Aided and encouraged by his equally tireless mother, Mrs. Ida M. Munson, this breeder has been growing a large number of tetraploid seedlings annually. In 1960 the Munsons treated some 8000 germinating seedlings, finally getting 200 affected survivors from a lot. Various diploid clones and seedlings have been treated by the Arisumi technique since it was published, with several instances of very important successes; many of these plants have been treated directly in the ground beds after the tops were cut off, and this work has usually been done most successfully in the fall. Mr. Munson annually has obtained the best new introductions from other tetraploid breeders, thus enlarging the genetic pool available for his work.

In Jenkinsburg, Georgia, Frank Childs began working with tetraploids even before the Crestwood Series became available. He also had germinating seedlings from his crosses treated, and this material was the foundation stock for his tetraploid breeding, which has led to a number of introductions.

Mrs. W. T. Hardy, of Mount Olive, Alabama, early began breeding tetraploid daylilies from introduced clones and seedlings of her own which she had someone treat for her. For a number of years she selected and introduced the new Traub varieties that were released, such as 'White Cloud.' In 1967 she bought a group of selected Griesbach seedlings, including 'Arriba'; these were released the following year.

Mr. Clyde W. Davidson, of Decatur, Georgia, bought his first tetraploid varieties in 1964; by 1968 he had named and introduced 8 of his own clones. The foundation stock included Fay, Traub, and Reckamp varieties.

Mr. C. T. Tanner (1972), of Cheneyville, Louisiana, tried seed treatment once unsuccessfully, and then turned to treating diploid clones by the Arisumi method. His trials have led him to do most of his treating in the fall in the open ground, and he uses a 0.02% solution because he prefers to re-treat after a couple of years rather than risk losing the plants from a higher concentration. Mr. Tanner has named and introduced some of his tetraploid seedlings.

In Iowa, Louisiana, Miss Edna Spalding (Ca. 1965) worked very hard for several years before her death treating many plants in the beds of her garden. She had even greater success than Mr. Tanner, and many of us are familiar with her 'Tetra Dorcas' and 'Tetra Edna Spalding'. She left a number of her own tetraploid seedlings, including 'Uncovered Treasure', released in 1969.

E. W. Brown III of Orange, Texas, began breeding tetraploid daylilies in the early 1960's, and it is reported that much work has been done at his ranch and that some clones have been named. It has not been possible to get definite information from Mr. Brown.

Dr. Margaret Alexander (Mrs. Kirby Vance) of Taylor, Texas, was one of the first to treat flower spikes of diploids, preferring to use disposable hypodermic syringes of her profession rather than the glass tubes suggested by the Buck article. She had favorable results and was able to get tetraploid seedlings for further breeding.

In Dallas, Texas, a small group of enthusiastic breeders has been working hard. Dr. Robert P. Miller (1968) began germinating and treating several hundred seedlings each year since 1963, and he has acquired many named tetraploid clones for his serious breeding program. Mr. Urey M. Winniford has been treating both sprouting seed and clonal material, and these he has used with representative varieties. He has introduced one tetraploid variety, 'Elma Lee'. Mrs. Jay E. Warner and her daughter Malinda became interested in tetraploid daylily breeding in 1961. In 1966 Malinda treated 3000 seedlings in preparing her Science Fair project, while Mrs. Warner treated 5000 seedlings in both 1966 and 1967. They both began treating ramets of named clones in early 1967. In the fall of 1967 Mrs. Warner set out 1000 fans of named and seedling diploids which, when established, were treated in the ground by cutting off the tops as in the Arisumi method but using a single drop of 1% colchicine solution in each fan. In the fall of 1968 Mrs. Warner treated an additional 1500 ramets, while Malinda treated 300 more for their big joint project, from which much can result.

In the West, Jack S. Romine, of Walnut Creek, California, became interested in tetraploidizing in about 1965 after visiting the Traub, Buck, and Peck gardens. Thereafter he treated hundreds of fans by the Arisumi method, and from chimeras and tetraploids obtained he made many crosses, using named tetraploid cultivars in addition. He now has an wide range of material to use in his breeding program.

(d) CONCLUDING REMARKS

This report covering the period, 1959—1968, the second decade of the species *Hemerocallis washingtonia,* shows clearly that this colchicine-induced species is a viable entity with a relatively large population distributed in the gardens of devotees in continental United States. Some plants are also grown in foreign countries, and these collections should increase materially during the third decade. Since the first report, the number of those who have introduced (registered) named clones has increased from 3 to 24, and no less than 211 named clones had been introduced during the second decade ending in 1968. Many others were engaged in breeding tetraploids, but had not as yet introduced any clones.

INDUCING POLYPLOIDY.—Steady progress has been made in devising methods for inducing polyploidy in diploid *Hemerocallis* so that even the beginning amateur may try his hand at this fascinating work. He now has the power to play God and enrich the gene pool of the new species. Great diligence is necessary to master the technique for inducing polyploidy. The amateur should try and try again until he has achieved his goal. The material must be in the right physiological condition when treated with the right concentration of colchicine. Other details also have to be just right. Only patient trials will bring the desired results.

BREEDING EXPERIMENTS.—It was noted from the start that no matter how wonderful the original diploid seedling or clone might be, the value of the resulting tetraploid can only be determined by actually testing it as a parent for important progeny. The writers can testify that they have often been disillusioned when the induced tetraploid gave poor or indifferent progeny. The rule should therefore be to discard and discard, starting again with new induced tetraploids. They should not cry over spilled milk, or blame the one who introduced the poor parent, but should get busy and induce some tetraploids of their own.

Perseverence is not only necessary when attempting to induce tetraploids that give excellent progeny, but also in breeding experiments to attain a desired objective. It is well known that only a very minor percentage of crosses are superior plants. Thus, it is necessary not only to try promising crosses in various directions again and again, but also to discard and discard, keeping only the very finest as parents of the next generation.

At the end of the second decade, it is clear that desirable flower size has been attained, and the color range has been increased so that it varies from very light yellow, yellow, orange, pumpkin, red, pink, purplish and bluish. The pure white daylily has not been achieved. Probably X-ray treatment can do the job? The next important step is to breed for color fastness, which has been achieved in some tetraploids; and colors which although changing slightly are still desirable at the end of the day, and can withstand the effects of rain and dry winds. And the time has arrived when plants of excellent growth habit should be the objective sought by the breeder. Plants should ordinarily be three feet or less in height, recurrent blooming, evergreen or semi-deciduous for southern climates, and deciduous for northern regions.

The third decade should bring some outstanding results by 1978.

TABLE 2. Catalog of named clones of **Hemerocallis washingtonia** Traub introduced during the second decade, Jan. 1, 1959—Dec. 31, 1968. Number of hybridizers, 24; number of clones introduced: 211.

HYBRIDIZERS

Benzinger, Mr. F. M. (Va.)
*Buck, Mr. W. Quinn (Calif.)
Childs, Mr. Frank W. (Ga.)
Davidson, Mr. Clyde W. (Ga.)
Fay, Mr. Orville W. (Ill.)
Griesbach, Dr. R. A. (Ill.)
Hamacher, Mrs. Lavinea (Mich.)
Hankins, Mrs. Wm. F. (Fla.)
Hardy, Mrs. W. T. (Ala.)
Hite, Mr. H. J. (Mich.)
Long, Mr. J. H. (Ga.)
Maynard, Mrs. C. G. (Mich,)
McEwen, Dr. Currier (Maine)
Moldovan, Mr. S. C. (Ohio)
Munson, Mr. R. W., Jr. (Fla.)
Peck, Dr. Virginia L. (Tenn.)
Reckamp, Bro. Charles (Ill.)
Rudolph, Mr. N. H. (Ill.)
* Schreiner, Mr. Robert (Oregon)
Sellers, Mr. Van M. (N. C.)
Tanner, Mr. C. T. (La.)
*Traub, Dr. Hamilton P. (Calif.)
Webster, Mr. R. L. (Ala.)
Winniford, Mr. U. G. (Tex.)

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* Hybridizers who introduced named clones also during the first decade (1949—1958).

NAMED CLONES

'Adam' (Moldovan, 1968)R; Red with blue cast.
'Adela' (Griesbach-Hardy, 1968) R; Pink melon self.
'African Gold' (Benzinger, 1968) R; Golden orange self.
'African Melon' (Benzinger, 1968) R; Light melon blend.
'Alcazar' (Traub, 1959), Golden West Bulb Farm catalog. Nasturtium orange.
'Alison' (Peck, 1968) R; Pink blend.
'Allegiance' (Griesbach, 1968) R; Red self.
'Allurearama' (Hamacher, 1967) R; Brilliant yellow self.
'Angelus Bells' (Hite, 1968) R; Coral suffused gold.
'Ann Castonguay' (McEwen, 1968) R; Rich yellow melon self.
'Anya' (Munson, R. W. 1966) R; Yellow self.
'Arbordale' (Davidson, 1967) R; Melon pink with pink midrib.
'Arcadia Buttercup' (Buck, W.Q., 1963) R; Empire yellow self.
'Arriba' (Griesbach 1968) R; Dark red self with green throat.
'Asia Minor' (Munson, R.W., 1965) R; Orange gold self.
'Ballerina' Pink (Tanner, 1968) R; rose pink blend.
'Barcelona' (Schreiner, 1968) R; Bright orange self.
'Beaumont' (Davidson, 1967) R; Light yellow self.
'Bengaleer' (Peck, 1968) R; Deep yellow self.
'Big Brassy' (Buck, 1961); Bright gold self.
'Billy Budd' (Traub, 1959); Golden West Bulb Farm catalog. Red self.
'Binnorie' (Peck, 1968) R; Pink blend with yellow throat.
'Bond Street' (Hardy, 1967) R; Golden orange self.
'Bonnie Barbara Allen' (Peck, 1967) R; Rose pink self.
'Bonnie John Seton' (Peck, 1967) R; Light yellow self.
'Bonny Hour' (Peck, 1968) R; Peach pink blend with green throat.
'Borderline Gold' (Benzinger, 1968) R; Red with gold border.
'Bountiful Harvest' (Reckamp, 1967) R; Buff with orchid midribs.
'Bright Copper' (Fay, 1968) R; Bright copper self.

'Bright Dawn' (Rudolph, 1967) R; Deep golden yellow self.
'Butterfly Beauty' (Traub, 1966) R; Yellow self.
'Cabrillo' (Traub, 1959) Golden West Bulb Farm catalog. Cadmium orange self.
'Cahaba Gold' (Hardy, 1967) R; Golden orange self.
'Canary Butterfly' (Traub, 1959) Golden West Bulb Farm catalog. Canary yellow.
'Canary Glow' (Benzinger, 1968) R; Canary yellow self.
'Captain Reid' (Traub, 1959) Golden West Bulb Farm catalog. Deep red self.
'Caption' (Griesbach-Hardy, 1968) R; Lavender self.
'Cathedral Bells' (Childs, 1965) R; Pink blend with green throat.
'Catoosa Dream' (Long, J.H., 1967) R; Cream blend.
'Catoosa Sun' (Long, J.H., 1967) R; Golden self.
'Champlain' (Davidson, 1967) R; Medium yellow self.
'Changing Times' (Reckamp, 1966) R; Creamy apricot blend.
'Cherokee Princess' (Peck, 1967) R; Blush pink blend.
'Cherry Cheeks' (Peck, 1968) R; Rose pink blend.
'Child of Ann' (Hanacher, 1968) R; Medium self with yellow throat.
'Commandment' (Reckamp, 1968) R; Bright pinkish orange blend.
'Coventry Court' (Munson, R.W., 1968) R; Peach rose blend.
'Crestwood' (Fay-Griesbach, 1961) R; very light melon self.
'Crestwood Ann' (Fay-Griesbach, 1961) R; Medium melon self.
'Crestwood Bicolor' (Fay, 1961) R; cream and bronze bicolor.
'Crestwood Evening' (Fay-Griesbach, 1961) R; Canary self.
'Crestwood Gold' (Fay-Griesbach, 1963), Fay catalog. Gold self.
'Crestwood Lucy' (Fay-Griesbach, 1963); Moldovan's catalog. Salmon pink.
'Crestwood Rose' (Fay-Griesbach, 1961) R; Deep rose pink self.
'Deacons Darling' (Maynard, 1966) R; Yellow self.
'Doctor Whitaker' (Traub, 1959); Golden West Bulb Farm catalog. Tangerine orange.
'Domani' (Munson, R.W., 1967) R; Rose pink self.
'Douglas Dale' (Peck, 1968) R; Red blend.
'Drexel' (Davidson, 1967) R; Light yellow self.
'Earl Brand' (Peck, 1967) R; Medium yellow self.
'Egleston' (Davidson, 1967) R; Copper gold.
'Elfin Knight' (Peck, 1967) R; Pink apricot blend.
'Elizabeth Traub' (Traub, 1959); Golden West Bulb Farm catalog; orange self.
'Elna Lee' (Winniford, 1968) R; Melon self with green throat.
'Elvira' (Traub, 1960), Golden West Bulb Farm Catalog. Chinese yellow self.
'Empress Mei Ling' (Munson, R.W., 1967) R; Rose self.
'Envoy' (Reckamp, 1966) R; Cream pink blend.
'Esperanza' (McEwen, 1967) R; Golden orange self.
'Eve' (Moldovan, 1968) R; Pink self.
'Fair Annet' (Peck, 1967) R; Pink blend.
'Fair Isabel L' (Peck, 1967) R; Apricot pink self.
'Fair Margaret' (Peck, 1967) R; Apricot pink and yellow blend.
'Fairview' (Davidson, 1968) R; Rose pink with darker viens.
'Forecast' (Hardy, 1967) R; Bright medium yellow self.
'Fortune Teller' (Reckamp, 1968) R; Creamy buff with rose purple eyezone.
'Frosted Full Moon' (Hamacher, 1966) R; Vivid yellow self.
'Georgica' (Munson, R. W., 1966) R; Rose self.
'Gertrude Smith' (Fay, 1966) R; Light tan pink.
'Gil Benton' (Peck, 1967) R; Apricot yellow blend.
'Giordano Bruno' (Traub, 1959); Golden West Bulb Farm catalog. Dark reddish orange.
'Glendale' (Davidson, 1968) R; Melon with pink midrib.
'Glowing Times' (Benzinger, 1967) R; Yellow gold self.
'Golden Bounty' (McEwen, 1968) R; Rich gold self.
'Golden Note' (Hardy, 1967) R; Deep golden yellow self.
'Golden Prize' (Peck, 1968) R; Gold self.

'Golden Surrey' (Fay, 1967) R; Golden yellow self.
'Good Omen' (Reckamp, 1968) R; Orange apricot overlaid gold.
'Grecian Garden' (Munson, R.W., 1967) R; Cream melon self with cream throat.
'Gypsy Laddie' (Peck, 1967) R; Rose pink blend.
'Heather Green' (Peck, 1968) R; Pink blend.
'Heavenly Harp' (Reckamp, 1966) R; Apricot overlaid bright gold.
'Hibernian' (Hardy, 1967) R; Green yellow self.
'High Spirit' (Reckamp, 1968) R; Apricot cream blend.
'Holy Grail' (Reckamp, 1968) R; Cream yellow blend.
'Imp' (Buck, W.Q., 1963) R; Blend of gold.
'Impertinence' (Buck, W.Q., 1963) R; Dark golden orange.
'Intensified Tide' (Benzinger, 1968) R; Reddish brown, brushed yellow.
'Iron Gate Premier' (Sellers, 1968) R; Red self.
'Jamie Douglas' (Peck, 1967) R; Deep yellow self.
'Katherine Cogswell' (McEwen, 1968) R; Soft rich rose pink self.
'Katherine Jaffray' (Peck, 1967) R; Apricot pink blend.
'Kathleen Elsie Randall' (Fay, 1965) R; Creamy melon, orchid midribs.
'Kathy Goodrich' (McEwen, 1968) R; Apricot melon self.
'Kemp Owen' (Peck, 1967) R; Soft yellow self.
'Lacearama' (Hamacher, 1967) R; Strong pink.
'Lady Cynthia' (Fay, 1965) R; Melon, pink midribs.
'Lady Liberty' (Hardy, 1967) R; Golden yellow self.
'Lemon Beauty' (Traub, 1959); Golden West Bulb Farm catalog. Lemon yellow.
'Lord Randall' (Peck, 1967) R; Yellow and pink bicolor.
'Loyal Subject' (Reckamp, 1966) R; Yellow apricot blended pink.
'Lucia' (Traub, 1959), pink.
'Lucretius' (Traub, 1959); Golden West Bulb Farm catalog. Cadmium orange.
'Lynn Markham' (Fay, 1967) R; Pinkish melon self.
'Machu Pihu' (Hite, 1968) R; Coral with lavender overlay.
'Madrid' (Traub, 1959), Golden West Bulb Farm catalog. Vivid red self.
'Magdalena Leuthi' (Traub, 1959); Golden West Bulb Farm catalog. Empire yellow.
'Magic Wand' (Reckamp, 1968) R; Apricot overlaid gold.
'Major' (Childs, F. 1968) R; Gold self.
'Mary Gray' (Peck, 1967) R; Melon pink blend.
'Mary Hamilton' (Peck, 1967) R; Creamy yellow, pink undertone.
'Mary Todd' (Fay, 1967) R; Buff self.
'Matilda Mendez' (McEwen,1968) R; Pale yellow melon self.
'Milady Lou' (Hamacher, 1967) R; Strong yellowish pink.
'Milanese' (Munson, R.W. 1965) R; Pale amber rose.
'Minted Gold' (Reckamp, 1968) R; Gold self.
'Moire Night' (Benzinger, 1968) R; Raspberry and purple blend.
'Moon Temple' (Fay, 1967) R; Sulphur self.
'Noahs Ark' (Reckamp, 1968) R; Creamy buff yellow self.
'Northbrook Gold' (Fay, 1968) R; Gold self.
'Northbrook Pink' (Fay, 1968) R; Dawn pink self.
'Northbrook Star' (Fay, 1968) R; yellow self.
'Notable' (Childs, F. 1968) R; Peach self.
'Ophelia' (Traub, 1959); Golden West Bulb Farm catalog. Porcelain rose.
'Oporto' (Griesbach-Hardy, 1968) R; Lavender cast with deeper halo.
'Orange Star' (Rudolph, 1968) R; Orange self.
'Oriana' (Munson, R.W. 1966) R; Tomato cream with red halo.
'Oriental Mist' (Rudolph, 1968) R; Apricot with rose eyezone.
'Pacific One' (Traub, 1959); Golden West Bulb Farm catalog. Red self.
'Pacific Two' (Traub, 1959), Golden West Bulb Farm catalog. Red self.
'Padua' (Munson, R.W. 1966) R; Yellow gold self.
'Peter Cooper' (Traub, 1959); Golden West Bulb Farm catalog. Tangerine orange.

'Phantom Ring' (McEwen, 1968) R; Pale greenish yellow with reddish pink halo.
'Picture Perfect' (Webster, 1968) R; Gold self.
'Pinkarama' (Hamacher, 1967) R; Strong pink self.
'Pink Ballet' (Hamacher, 1968) R; Strong yellowish pink self.
'Pink Contrast' (Webster, 1968) R; Pink blend with darker halo.
'Pink Darling' (Benzinger, 1968) R; Baby ribbon pink.
'Polka Time' (Hardy, 1967) R; Burnt orange with red brown eyezone.
'Prolific' (Fay, 1965) R. Golden yellow self.
'Purple Premier' (Traub, 1959), Golden West Bulb Farm catalog. Purplish reddish.
'Queen Eleanor' (Peck, 1967) R; Shell pink self.
'Quinque' (Benzinger, 1967) R; Gold self.
'Ralph Cornell' (Buck, W.Q. 1961), Orange and red bicolor.
'Red Waves' (Schreiner, 1968) R; Bright red self.
'Reverend Traub' (Traub, 1959), Golden West Bulb Farm catalog. Cadmium orange self.
'Rocket City' (Hardy, 1967) R; Bittersweet orange.
'Rosarama' (Hamacher, 1966) R; Deep rose pink self.
'Rose Halo' (Rudolph, 1968) R; Medium rose with deeper halo.
'Salmon Orchid' (Traub, 1959), Golden West Bulb Farm catalog. Rosy salmon.
'Satin Silk' (Peck, 1968) R; Pink blend.
'Seaways Coral' (McEwen, 1967) R; Chinese coral with lighter edges.
'Seed Setter' (Hardy, 1968) R; Deep melon self.
'Serene Silence' (Reckamp, 1968) R; Ivory yellow with pink midribs.
'Shell Pink' (Fay, 1968) R; Shell pink self.
'Silver Fan' (Peck, 1968) R; Creamy yellow blend.
'Sing Toy Allah' (Hite, 1968) R; Light yellow self.
'Sir Patrick Spens' (Peck, 1967) R; Red self.
'Space Ship' (Benzinger, 1967) R; yellow gold self.
'Sue Booth' (Buck, W.Q., 1961), Brown and yellow bicolor.
'Summer Portrait' (Tanner, 1968) R; Peach brushed pink, edged rose, lavender midribs.
'Surprise Package' (Fay, 1965) R; yellow self.
'Tamlin' (Peck, 1967) R; Rose pink; deep rose eyezone.
'Tetra Arthurstar' (Traub, 1959), Golden West Bulb Farm catalog. Medium red self.
'Tetra Aurantorosea' (Buck, W.Q. 1961), Salmon; lighter sepals and midribs.
'Tetra Blossom' (Buck, W.Q. 1961), Empire yellow self.
'Tetra Carmine' (Traub, 1959), Golden West Bulb Farm catalog. Carmine self.
'Tetra Elaine' (Traub, 1959), Light pastel pink.
'Tetra Elyandre' (Traub, 1959), Golden West Bulb Farm catalog. Polychrome eyed.
'Tetra MacArthur' (Traub, 1959), Brilliant red self.
'Tetra Prima Donna' (Buck, W. Q. 1961), Salmon pink blend.
'Tetra Red' (Hamacher, 1967) R; Strong red self.
'Tetra Rose' (Traub, 1959), Golden West Bulb Farm catalog. Medium rose.
'Tetra Salmon Sheen' (Buck, W. Q. 1963) R; Rich salmon self.
'Tetra Yandre' (Traub, 1959), Light brown red.
'Tetra Yandrestar' (Traub, 1959); Golden West Bulb Farm catalog. Polychrome, eyed.
'Thomas Rymer' (Peck, 1967) R; Coral and lavender pink.
'Traub Violetta' (Traub, 1959), Golden West Bulb Farm Catalog. Lavender-reddish-violet.
'Trinity' (Childs, F. 1967) R; Pink bitone; olive green throat.
'Trumpeter' (Hankins, 1967) R; Orange with red halo.
'Twilight Sky' (Fay, 1968) R; Pink melon self.
'Velvet Butterfly' (Traub, 1966) R; Bright gold yellow self.

'Viking Prince' (Webster, 1968) R; Medium gold yellow self.
'Vincent' (Griesbach-Hardy, 1968) R; Rose with deeper halo.
'Welcomed Change' (Benzinger, 1967) R; Pink polychrome.
'White Cloud' (Traub, 1967) R; very light yellow self.
'White Prelude' (Traub, 1960); Golden West Bulb Farm Cat. 2., very light yellow.
'Wyndham Hayward' (Traub, 1959), Golden West Bulb Farm catalog. Orange with reddish eyezone.
'Yellow Beauty' (Rudolph, 1967) R; Golden yellow self.
'Yellow Champagne' (Rudolph, 1967) R; Sulphur yellow self.
'Zippity Zip' (Hamacher, 1968) R; Yellowish pink self.

LITERATURE CITED

Arguimbau, N. C. Identification of chimeras among colchicine-treated seedlings. Hemerocallis Jour. **21**(4): 18-21. 1967 (Oct.-Nov.-Dec. 1967)

Arisumi, Toru. Colchicine-induced tetraploid and cytochimeral daylilies. Jour. Hered. LV: (Nov.-Dec.): 254-261. 1964. Reprinted, Hemerocallis Jour. **20**(2): 59-67. 1966.

Benzinger, F. M. Results of selfing and crossing tetraploid clones. Hemerocallis Jour. **20**(2): 68—69. 1966 (Apr.-May-June)

——. Personal communication. 1972.

Buck, W. Quinn. Colchicine-induced polyploid daylilies (Hemerocallis). Jour. Calif. Hort. Soc. X(4): 161. 1949.

——. An "injection" method for testing **Hemorocallis** spikes with colchicine. Calif. Hort. Jour. 29(2): 47—48. 1968. Apr. Reprinted, Hemerocallis Jour. **23**(2): 42-43. 1969. (Apr.-May-June)

Darrow, G. M. and Meyer, F. G. Daylily Handbook. Amer. Hort. Mag. **47**(2). 1968. Special issue.

Fay, Orville W. Report on tetraploid **Hemerocallis**, 1954—1964. Hemerocallis Jour. **18**(2): 55-57. 1964. (Apr.-May-June)

Flory, Walter S. and Ruth P. Phillips. Chromosome numbers in **Hemerocallis washingtonia** "static dwarf" plants. Plant Life **24**: 84—86. 1968.

Griesbach, R. A., O. W. Fay and Liam Horsfall. Induction of polyploidy in newly-germinated **Hemerocallis** seedlings. Hemerocallis Jour. **17**(2): 70-75. 1963.

Jablonski, Walter. Personal communication. 1972.

Lachman, W. H. A rapid method for the study of stomates as indication of polyploidy in **Hemerocallis.** Hemerocallis Jour. **21**(4): 21-22. 1967. (Oct.-Nov.-Dec.)

——. A simple method for inducing polyploidy in **Hemerocallis** seedlings. Hemerocallis Jour. **22**(3): 7—8. 1968. (Jul.-Aug.-Sept.)

Marsh, James E. Personal communications, 1972.

McEwen, Currier. Personal communications, 1972.

Miller, R. P. Tetraploids in the Dallas area. Hemerocallis Jour. **22**(1): 28-31. 1968.

Peck, Virginia. Induction and identification of polyploidy in **Hemerocallis.** Hemerocallis Jour. **18**(2): 57-61. 1964.

Peck, Virginia. Tetraploid **Hemerocallis** breeding report for 1963. Hemerocallis Jour. **18**(2): 62-64. 1964.

Peck, Virginia and Richard. Breeding and improvement in tetraploid daylilies. Hemerocallis Jour. **23**(2): 33-39. 1969.

Rechamp, Bro. Charles, S. V. D. Personal communications, 1967 through 1972.

Schreiner, Robert. 1951 Daylily Catalog.

Shults, Graf. On optimum X-ray exposure of **Hemerocallis** seeds. (Abstract). Plant Life **15**: 84. 1959.

Tanner, C. T. Personal communications, 1972.

Traub, Hamilton P. Colchicine-poisoning in relation to **Hemerocallis** and some other plants. Science **110**: 686—687. 1949.

——. Colchicine-induced **Hemerocallis** polyploids and their breeding behavior. Plant Life **7**: 83—116. 1951.

——. The first decade of **Hemerocallis washingtonia**. Plant Life **15**: 69—79. 1959 (Part 1); 16: 111—120. 1960 (Part II). Also reprinted in Hemerocallis Jour. **14**(2): 65—75. 1960 (Part I); **17**(2): 77-86. 1963 (Part II)

——. "Stamen-embracing petepalsegs" heritable defect in **Hemerocallis.** Plant Life **24**: 84. 1968.

——, G. H. Bohn & Thomas W. Whitaker. The inheritance of melon flower color in **Hemerocallis washingtonia.** Plant Life **24**: 163—164. 1968.

Warner, Mrs. Jay E. Clonal treatment with colchicine of adult clones. Hemerocallis Jour. **23**(2): 39-41. 1969.

THE ART OF DECOUPAGE BEING REVIVED

Mrs. Enna Chairs, *Federalsburg, Maryland*

EDITORIAL NOTE.—Mrs. Enna Chairs teaches classes in the art of decoupage attended by Mrs. Doris H. Moran and her husband, Mr. Kendall A. Moran, of Federalsburg, Maryland. The Morans presented an excellent example of their work, showing the Aztec Lily, **Sprekelia formosissima** to the American Plant Life Society. This was shown at the 1972 Spring Amaryllis Show at Arcadia, Calif., and was much appreciated by all who attended the Show.

The following notes were furnished to Mrs. Moran by Mrs. Enna Chairs and are reproduced here for the information of the members of the American Plant Life Society who may be interested in the revival of this art.

That word means cut-out and so decoupage is the art of decorating surfaces with paper cut-outs. Decoupage is thought to have originated in Venice, Italy in the 17th. century. The art soon spread to other European Countries. There are many exquisite works in museums throughout the world and in private collections. Decoupage lasted into the 19th. century and then faded. Now attempts are being made to revive it in this country.

In order to make a plaque such as the one with the Amaryllis on it—you first have chosen the print and cut it out with an X-acto knife and curved cuticle scissors. Prepare the plaque by sealing the wood first, then filling in any holes, gouges or nicks with plastic wood. When dry, sand and then finish smoothing the surface with 0000 steel wool. Clean the surface well and it is time to paint. Use water base paint thinned out and this should insure no brush marks. Painting on 10 to 12 coats and allowing 20 to 30 minutes between coats. Now sand lightly with 600 sand paper and clean surface of all lint.

Ready to paste on the cut-out. Use a water soluble glue and make sure every part of cut-out is well covered. Then lay a piece of wax paper over plaque and cut-out and roll with a brayer (small wall paper roller); starting your rolling in center and smooth out toward the edges. Allow to dry several hours and then clean excess glue from around the cut-out and on plaque. Warm water should do the clean up job, but never leave water lay on plaque. You may use a small piece of sponge and Q-tip. Allow to dry and then spray with a clear plastic spray. Let picture set for 12 hours, then rub down lightly with a piece of 0000 steel wool.

Now for varnishing—The varnishing is what, in the end, makes or breaks the appearance of the article that is being decoupaged. ALWAYS use a high grade of varnish and either glossy, semi-glossy or flat varnish can be used. Use a good brush, between ½″ to 2½″, to apply the varnish. Dip brush into the varnish & flow it onto the surface, brushing in one direction only. Remove any hairs from brush immediately and if you have any runs brush them out before varnish sets up.

They claim you should leave each coat of varnish 24 hours for drying. Many people make the error of trying to get the coats on fast, but that is a No-No. Continue applying coats of varnish until you can no longer feel the cut-out. In other words completely sink the cut-out in the varnish and that may take as many as 50 or 60 coats of varnish. After 15 coats of varnish are applied, wet sand with 400 or 600 sand paper. Then wash the surface with soapy water and allow to dry. Make sure all lint is removed before starting your varnish coats again. Only stop when you can no longer feel edges or traces of the cut-out.

The final step is another wet sanding, steel wooling and finishing. The finishing is done with any good paste wax. Use just a little wax and work in a small area in the circular motion until desired sheen is acquired.

Decoupage work and gold leafing on glass is also a very interesting and rewarding art.

I tell my friends that only through patience and effort can any of this Art be properly achieved.

RANGPUR LIME, **CITRUS RANGPURIENSIS SP. NOV.** SCALE AND MEALYBUG RESISTANT

Hamilton P. Traub

For many years in California, the writer attempted to grow the 'Tahiti' ('Persian') and 'Bearss Seedless' varieties of the Common Lime, *Citrus aurantifolia* (Christm.) Swing. as home garden trees. However, these proved burdensome because ants colonized scale and mealybug insects on the trees making necessary expensive control measures to keep the trees free of the two pests. Then, he remembered the Rangpur Lime which he had grown in Florida. He had no remembrance of scale and mealybug pests on the trees there. Attempts were made to find a source of this species. Luckily, a form of it was located in a neighbor's garden. Cuttings were obtained and rooted, and the trees were set out. He was greatly pleased when no signs of scale and mealybug pests were ever found on the trees; even when grown side by side with the common lime varieties already indicated. The only pest noted so far is the slight presence of aphids on the tips of the new growth in the spring. This is easily controlled by overhead sprinkling.

The Rangpur Lime is considered of hybrid origin. Although it has been grown in India and elsewhere for a very long time, the entity has not been recognized as a species in spite of the fact that the rind and pulp are orange-colored, and the fruit segments separate as easily as in the tangerine. It is named here as a distinct species because it cannot be included with any of the other *Citrus* species.

Citrus rangpuriensis Traub, **sp. nov.** (Rutaceae)

Arbor parva vel usque ad maior sempervirens spinosa, foliis illas Citri aurantifoliae strictim consimilibus; anthesi recurrenti, floribus mediocribus aliis speciebus Citri consimilibus, 5-fasciculatis vel solitariis, alabastro mediocriter purpureis, in statu plene expanso infus albis extus perpallide purpureascentibus; fructibus mediocribus vel marioribus, cortici aurantiaco, segmentis facile secedentibus, pulpa aurantiaca acida; seminibus paucis.

Holotype: Traub No. 1020 (TRA), grown at 2678 Prestwick Court, La Jolla, Calif., July 7, 1972.

Small or larger evergreen shrub or tree, spiny; foliage resembling that of the lime somewhat; recurrent blooming, flowers medium-sized, similar to those of the other *Citrus* species, produced in clusters of up to 5, or sometimes singly, medium purple in bud; when fully open, white within, very light purplish on the outside; fruit medium to larger in size, with orange-colored rind, fruit segments separating easily, pulp orange-colored, acid; seeds few.

PLANT LIFE LIBRARY—continued from page 122.

REASON AND EXPERIENCE: THE REPRESENTATION OF NATURAL ORDER IN THE WORK OF CARL VON LINNE, by James L. Larson. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1971. Pp. 178. Illus. $7.50. Subtitled, "The Representation of Natural Order in the work of Carl von Linné," the author traces the maturation of Linnaeus' conception of species, genera and higher categories as the foundation of a practical classification, based on sexual characters, as contrasted with the need of a natural system which he recognized as the ultimate aim, but which he could not achieve in his time. The book is divided into five chapters: (1) The system of nature and the natural method: (2) classes and orders: (3) genera; (4) species and varieties; and (5) nomenclature. Recommended to all interested in the history of botany.

EXOTIC MUSHROOMS (NOUVEL ATLAS DES CHAMPIGNONS), edited by Henri Romagnesi (adapted by Rhea Rollin & E. W. Egan). Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Text pp. 14; I—XVIII; color plates 1—160. Trade Edition, $12.95. This outstanding Atlas of 160 color plates depicting at life size mushrooms in their natural colors, at the modest price charged, is among the better bargains in books offered during the current year. The book is concerned with the larger-sized members of what the editor calls the higher fungi—Ascomycetes (sac fungi) and Basidiomycetes (club fungi). The text details the role of mushrooms in the life cycle, how mushrooms grow, poisonous and edible mushrooms and mycology, the classification of mushrooms. There are 18 charts, accomodating more than 160 diagrams to help identify the spore and specialized organs of the mushrooms pictured in color on plates 1 through 160. The outstanding color reproductions of mushrooms in this book (all suitable for framing) will appeal not only to naturalists but also to artists and designers as a mine of information. Very highly recommended.

PLANT LIFE LIBRARY

CLASSICA BOTANICA AMERICANA, edited by Joseph Ewan; published by Hafner Publ. Co., New York. Additional volumes in this series (vols. 6 & 7) have recently appeared.

Dr. Ewan has suggested three periods in the development of botany in the United States for the decades from 1800 through 1860: (1) the Barton Period, 1800 to 1815, which included the publication of the significant Michaux accounts; (2) the Eaton-Nuttall period (1816—1820), during which Amos Eaton moved botany into the schools and academies, and Nuttall published his "Genera of North American Plants" (1818); and (3) the Torrey—Gray period (1821—1861), during which Stephen Elliott published his "Sketch of the Botany of South-Carolina and Georgia" (1821-1824), and Torrey and Gray built upon Nuttall's **Genera.**

Hafner Publ. Co., has recently published two facsimile reprints in the Classica Botanica Americana series which fall in the second, (1816-1920) and third (1821-1861) periods. In each case, the attractively produced reprint is preceded by an informative introduction by Dr. Joseph Ewan.

A SKETCH OF THE BOTANY OF SOUTH-CAROLINA AND GEORGIA, by Stephen Elliott, with an Introduction by Joseph Ewan. Vol. 1. Pp. xxxvii + 606 + Plates XII. 1821. Vol 2. Pp. 743 + 14 (Glossary). 1824. Facsimile of the 1816-24 edition. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Elliott's **Sketch** is considered a classic in its field. Rafinesque had remarked that under "the modest title, we have the best Flora of the Southern States". Ewan has pointed out that through the publication of the **Sketch,** the botanical identifications of Muehlenberg and Baldwin were validated. The existence of voucher specimens of most of Elliott's proposed species makes them verifiable. Again, we are indebted to Hafner Publ. Co., for making the Elliott classic **Sketch** available to all interested workers in this fine facsimile edition.

THE GENERA OF NORTH AMERICAN PLANTS, by Thomas Nuttall, with an Introduction by Joseph Ewan. Vol. 1. Pp. xxxvi + viii + 512. 1818. Vol. 2. Pp. 254 + 10 + 4. 1818. Facsimile of 1818 Edition. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Nuttall brought together descriptions of the North American plants known to him in his 2 volume work. He followed the artificial Linnean sexual system as was the custom with most of his colleagues, but he substituted the English language for the Latin which was a definite advance. Ewan has pointed out that "Throughout the **Genera** there are critical assessments based mostly on personal observation in the field and first hand acquaintance with the plants. Neither Michaux or Pursch had so wide a background as Nuttall and therein rests the importance of his **Genera** for his contemporaries as for botanists today intent on knowing the state of knowledge in 1818." John Torrey and his apprentice Asa Gray were to build on Nuttall's overview of North American genera. Nuttall recognized 834 genera, including 42 newly proposed. We are highly indebted to the Hafner Publ. Co., for this fine facsimile edition of Nuttall's **Genera.**

MANUAL OF THE SOUTHEASTERN FLORA, by John Kunkel Small. Vol. 1. Pp. xxii + 774. 1933; Vol. 2. Pp. 775—1554. 1933. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. (Facsimile of the 1933 Edition). 1972. The late Dr. Small's Southeastern Flora (1933) has long been out of print, and thus the publication of this facsimile reprint will be welcomed by the many who do not at present own this two volume set. Gray's Manual of Botany (7th ed. 1908; 8th ed. 1950 is concerned with the Northeastern United States and adjacent Canadian Floras, and thus Small's text has served since 1933 as one of the supplements to cover the flora of the southeastern United States. Thanks are due the Hafner Publishing Co., for the publication of this fine facsimile reprint edition at this time.

MANUAL OF VEGETATION ANALYSIS, by Stanley A. Cain and G. M. de Oliveira Castro. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. Facsimile of the 1959 edition. 1971. Pp. xvii +325. Illus. $12.00. This stimulating text is concerned with the application of phytosociological concepts and methods, most of which had originated in the north temperate regions, and their testing under tropical conditions in Brasil. The subject is developed under the following headings,—floristics; the community; major vegetation types of the world as exemplified in the tropical rain forest; analysis of vegetation; the problem of numbers—abundance and density; the problem of pattern—frequency; the problem of dominance—coverage; size of sample unit; community characteristics; concepts important in synthesis, and life form and leaf size. Highly recommended to all interested in vegetation analysis.

ISLAND YEAR, by Hazel Heckman. University of Washington Press, Seattle, Wash. 98105. 1972. Pp. xi + 255. Illus. $7.95. This book is concerned with six-by-three mile Anderson Island in Puget Sound. It provides an insight into the natural life, and the recordings of the seasons as experienced by Mrs. Heckman, who is an appreciative and articulate observer. Her diary records the surprises each month brings, the blossoming of the wild red-currant, the appearance of a pod of killer whales, many types of birds, and wild flowers, etc. But the developers have arrived, and the natural world of the Island is threatened as a way of life of its people. Can Anderson Island be saved? Only history will bear witness. This charming book is recommended to all readers.

THE QUANTITATIVE ANALYSIS OF PLANT GROWTH, by G. Clifford Evans. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1972. Pp. xxvii + 734. $22.00. This attractive book is designed to assist ecologists and others who desire quantative solutions to problems involving plants growing in natural and semi-natural conditions. It is based mainly on field studies and examines the difficulties encountered when attempting to relate growth to environment, developmental sequences and genetic constitution. Natural sources of variation between plants, and the classical methods of analysis with recent extensions are discussed and exemplified. This outstanding new book will be useful to those with formal training in the plant sciences and also to many others interested in plants. Very highly recommended.

FLORISTICS AND PALEOFLORISTICS OF ASIA AND EASTERN NORTH AMERICA, edited by Alan Graham. Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1972. Pp. xii + 278. Illus. $25.00. The papers of this symposium on the distribution and differentiation of plant groups common to Asia and North America show the emerging view that "the mixed mesophytic forest, its history, and the origin of floristic affinities between Asia and North America is more complicated and less well understood than generally reflected in the phyto-geographic literature." This stimulating book is required reading for all interested in the floristics of Asia and North America. Very highly recommended.

MAIZE ROUGH DWARF, by Isaac Harpaz. Halstead Press, Division of John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1972. Pp. xvi + 251. Illus. $24.00. "Maize Rough Dwarf" is a virus disease which is primarily a pathogen of plant hoppers with Maize (Amerindian Corn), rice, small grains and grasses serving as intermediary hosts in the passage back to the plant hopper. Local European plants affected are relatively immune to the disease at present, however when hybrid maize was introduced from the United States into Europe the result was drastic resulting in up to 70% reduction in the crop. The value of the book is in that it serves as a warning, indicating that all possible measures should be taken to prevent the introduction of the pathogen into the United States. Highly recommended to all interested in disease control.

RECENT ADVANCES IN PHYTOCHEMISTRY. Vol. 4. Edited by V. C. Runeckles and J. E. Watkin. Appleton-Century-Crofts, Educational Division, Meredith Corporation, 440 Park Av. S., New York, N. Y. 10016. 1972. Pp. x + 317. Illus. The present volume is based upon the papers presented at the 9th Annual Symposium of the Phytochemical Society in 1969. It was focussed on plant phenolic compounds. Topics ranged from the simple phenols to lignin, and covered aspects of their chemistry, biochemistry and physiology, including commentaries on evolutionary developments. This volume is indispensible to all interested in phyto-chemistry. Very highly recommended.

SEED BIOLOGY, edited by T. T. Kozlowski. 3 Vols. Academic Press, 111 5th Av., New York, N. Y. 10003. 1972. Vol. I. Importance, development and germination. Pp. 416. Illus. $24.00. Vol II. Germination control, metabolism and Pathology. Pp. 447. Illus. $26.00. Vol. III. Insects, and seed collection, storage, testing and certification. Pp. 422. Illus. $26.00. This new, three-volume treatise provides the most comprehensive and up-to-date coverage available of the many aspects of seed biology, including modern treatments of the importance and characteristics of seeds, seed development, mechanisms of seed dispersal, seed germination, seed deterioration, protection of seeds from diseases and insects, seed collection and identification, seed storage and longevity, and seed testing and certification. These texts will be useful as reference material for researchers and seed producers, as well as texts or references in upper level and graduate courses in agronomy, horticulture, botany, entomology, forestry, and plant pathology. The material is interdisciplinary in scope and will be of interest to seed growers, seed analysts and technologists, economic botanists, agronomists, horticulturists, nurserymen, foresters, plant anatomists, biochemists, plant physiologist, ecologists, plant pathologists, entomologists, geneticists, and regulatory personnel concerned with seed quality, storage certification, and distribution. Highly recommended.

RECORDS OF THE AMERICAN-AUSTRALIAN SCIENTIFIC EXPEDITION TO ARNHEM LAND. Vol. 3. BOTANY AND PLANT ECOLOGY, edited by R. L. Specht and C. P. Mountford. Melbourne Univ. Press. 1958. For sale by International Scholarly Book Services, Inc., P. O. Box 4347, Portland, Oregon. 97208. Pp. 522. Illus. $19.45. This is the third volume of the report on the 1948 scientific expedition to Arnhem Land; it is concerned with its botany and plant ecology. Various specimens of fungi, ferns, gymnosperms and angiosperms (over 1300 specimens) were collected. The studies concern the distribution of the flora in relation to geological history, climate, soils and notes on plants used by the aborigines. This outstanding volume is very highly recommended.

DISEASES OF PLANTS, edited by J. H. Western. Halstead Press Division, John Wiley & Sons, P. O. Box 4191, Grand Central Station, New York, N. Y. 10017. 1971. Pp. xii + 404. Illus. This up-to-date reference work by outstanding authorities will be welcomed. The particular disease concerned and its associated pathogen is accurately identified by the contributors, including the description of the diagnosis, cure or prevention of the crop diseases affecting the potato, sugar beet, cereals, herbage and forage legumes, grasses, vegetables and hops. Very highly recommended to the practising plant pathologist.

INTRODUCTION TO PLANT BIOCHEMISTRY, by T. W. Goodwin and E. I. Mercer. Pergamon Press, Inc., Maxwell House, Fairview Park, Elmsford, New York. 10523. 1973. This attractive new book was written for students who have had at least a one-year course in general biochemistry, and it should also be useful to natural product chemists and students in the applied aspects of biochemistry, such as food science and agricultural biochemistry. The subject is developed under appropriate headings—bioenergetics and enzyme kinetics; structure and function of the plant cell; the plant cell wall, photosynthesis, respiration; carbohydrate biosynthesis; lipid and nitrogen metabolism; nucleic acids and related compounds; terpenes and terpenoids; porphyrins; alkaloids; plant growth substances; and biochemistry of development and growth. Very highly recommended.

INORGANIC PLANT NUTRITION, by Hugh G. Gauch. Dowden, Hutchinson & Ross, Inc., P. O. Box 699, 523 Sarah St., Stroudsburg, Pa. 18360. 1972. Pp. viii + 488. Illus. $21.50. This attractive text on the basic processes and principles of the mineral nutrition of plants will be welcomed by students, teachers and research workers, and should serve as a companion book for courses in advanced plant physiology, soil fertility, and horticulture and agronomic crops. All aspects of the subject—from bacteria to the higher plants from absorption to limiting factors in growth are covered in detail and are thoroughly indexed. All major research papers from 1960 to the present, as well as selected classic studies from before 1960, are reviewed in detail with full citation of papers. A bibliography of over 2600 entries and nearly 2000 authors provides a complete reference source. Very highly recommended to all interested in plant nutrition.

PHYSIOLOGY AND BIOCHEMISTRY OF TOBACCO PLANTS, by T. C. Tso. Dowden, Hutchinson & Ross, P. O. Box 699, 523 Sarah St., Stroudsburg, Pa. 13360. 1972. Pp. xiii + 393. Illus. $24.50. An authority on the subject has produced an up-to-date source book on current tobacco research throughout the world. The subject is developed under six headings,—the plant and tobacco types; growth and development; post marketing handling; organic metabolism, leaf usability, and product regulation. Recommended to research workers, students, and those concerned with the composition and culture of tobacco and tobacco products.

PATTERNS IN PLANT DEVELOPMENT, by Taylor A. Steeves and Ian M. Sussex. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1972. Pp. xi + 302. Illus. This attractive text presents a factual account of the phenomena of development in vascular plants, including lower vascular plants, and the seed plants. The approach is structural, but emphasis is placed upon experimental and analytical data. Both the embryological phase and the phase of secondary growth are considered. The authors have attempted to document the developmental process as the plant undergoes its beginning with the zygote and the formation of the embryo, through the development of the primary body, and secondary growth, showing how the plant develops as an organism. This stimulating book is very highly recommended to all interested in plant science.

HORTICULTURAL SCIENCE, 2nd Edition, by Jules Janick, W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. x = 586. Illus. $12.00. This revision of an excellent standard text designed primarily for beginning students will be welcomed. Part I is concerned with the biology of horticulture,—the classification and structure of the plants; plant growth and development. Part II deals with the technology of horticulture,—controlling the plant environment, directing plant growth, biological competition, mechanics of propagation, plant improvement and marketing. Part III is concerned with the industry of horticulture,-horticulture geography, production systems, crops, and esthetics of horticulture. This outstanding text is very highly recommended to beginning students and all amateur horticulturists.

SOIL MICRO-ORGANISMS, by T. R. G. Gray and S. T. Williams. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Pp. viii + 240. Illus. $9.95. This timely book, concerned with the activities of the microflora in nature rather than in the laboratory, is intended mainly for undergraduate students taking courses in microbiology, soil science or botany, but it should also prove useful to school teachers and post graduate students. The topics discussed include,—the soil population; micro-organisms in the soil; methods for studying the ecology of soil micro-organisms; decomposition of dead organic matter; breakdown of organic chemicals in the soil; effects of living plants on the soil microflora; effect of micro-organisms on plant growth; autotrophic micro-organisms in soil; interactions between soil micro-organisms; and micro-organisms in the soil-plant ecosystem. Highly recommended.

HOW WE KNOW WHAT ON EARTH HAPPENED BEFORE MAN ARRIVED, by William C. Carter. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1972. Pp. 96 Illus. Trade Edition, $3.95. This easily readable, profusely illustrated and charming book for the young hobbyist interested in hunting fossils will serve as an effective introduction to the subject. Following the glossary of terms, the subject is presented in three parts: Part I, how we know, explains the evolution of the land masses and seas over the ages, the fossil record, animal fossils from trilobites to primates, including man; and plant fossils; Part II, is concerned with the collection of fossils, and the transition of the fossil hunter to paleontologist. Part III is concerned with the location of fossils in the 50 United States, from Alabama to Wyoming. An index completes the volume. There is no better gift for the young hobbyist; one which will keep him wholesomely employed during his leisure time. Very highly recommended to the young hobbyist.

The following are two new editions to the charming series of the Sterling Nature Series:

A TREE IS BORN, by J. M. Guilcher, and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 100. Illus. $3.50. Here the germination of the seeds of the Horse Chestnut, Oak and Walnut trees is presented in detail, including informative close-up photographic reproductions of the steps from immature flower buds, opening of the flowers, the stamens and pistil, the fruit, the seeds, sprouting seeds, and the growing seedlings. Similarly, in the case of the pine tree, the female and male cones, seeds and growing seedlings are illustrated. Very highly recommended to the young student.

A TREE GROWS UP, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1972. Pp. 96. Illus. $3.50. This is a companion to the book, reviewed above, showing in detail by means of illustrations and text the mature stage in the development of the Beach, Chestnut, Hornbeam, and 10 other species of trees. Highly recommended to the young student. Parents can make no better investment. Very highly recommended.

CRAFTING WITH NATURE'S MATERIALS, by Chester Jay Alkema. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 1972. Pp. 48. Illus. Trade Edition, $2.95. This charming craft book, adequately illustrated, shows how easily available materials can be fashioned into works of art—sculpture, mosaics, collage, weaving, pine cone and wood sculpture, spatter and spray painting, weed and plant sculpture and sand casting. This book should be available in every home with growing children. However, it also appeals to adults. Highly recommended.

The following two books are additions to the popular series of Sunset gardening books.

SUNSET IDEAS FOR LANDSCAPING, by the Editors of Sunset Books and Sunset Magazine. Lane Books, Menlo Park, Calif. 94025. 1972. Pp. 96. Illus. $1.95. This outstanding book includes specific guidelines to follow that will help the home owner most effectively to landscape his home. It is a guide to making the most of any particular piece of land that requires serious planning. A special section is helpful to evaluate ones needs, develop a workable design, and how to put it on paper. A helpful series of plant charts facilitates plant selection, and excellent photographs illustrate a wide variety of ideas for landscaping all types of homes, in all situations, and in all climates. This easily readable, and profusely illustrated book is highly recommended to all interested in landscaping the home grounds.

SUNSET IDEAS FOR JAPANESE GARDENS, by the Editors of Sunset Books and Sunset Magazine. Lane books, Menlo Park, Calif. 94025. 1972. Pp. 96. Illus. $1.95. This profusely illustrated book describes the basic principles and fundamentals of proportion and design of Japanese Gardens in terms of the United States gardener. Here are ideas for combining the three basic elements of the Japanese garden—stone, plant, water—to create an entirely new Japanese garden or modify an existing garden with an Oriental touch. Pathways, fences and gates, and structures—pagodas, tea houses, engawa, wells, lanterns—add interest to the Japanese garden and are discussed in several helpful chapters. Actual garden plans are shown and described to help start the reader on the way to Oriental garden beauty. Highly recommended to all interested in Japanese gardens.

THE NEW CREATIVE DECORATIONS WITH DRIED FLOWERS, by Dorothea S. Thompson. Hearthside Press, 445 Northern Blvd., Great Neck, N. Y. 11021. 1972. Pp. 156. Illus. $7.95. The author, who originated the now widely used silica gel method of drying flowers, here extends its use and branches out into new fields, showing how to dry plant material, drying buds and foliage, timing and storing, using spray and wax, pressing, antiquing flowers, making stems, retaining color and texture, making decorative wall panels, butterflies, decorated Japanese rocks, seed mosaics, espaliered trees, pressed flower pictures, botany frames, unique shadow boxes, mantel clocks, lamps, placques and mobiles, bedroom pictures, drawer pulls and pincushions. Also dried flower arrangements involving basic art principles and elements of design, and special instructions for handling materials. This profusely illustrated book is recommended to all interested in the decorative arts.

HAWAIIAN HERBS OF MEDICINAL VALUE, by D. M. Kaaiakamanu and J. K. Akina; translated by Akaiko Akana. First published in 1922; this is the 1972 facsimile reprint by Charles E. Tuttle Co., Rutland, Vermont, 05701. Pp. 74. $3.00. This is a brief catalog of the medicinal herbs found among the mountains and elsewhere in the Hawaiian Islands and assumed by "the Hawaiians to possess curative and palliative properties most effective in removing physical ailments." The publishers do not endorse nor do they make any claim "as to the efficacy of the remedies given; nor do (they) guarantee the accuracy of the scientific identifications of the herbs used." Recommended to all interested in Hawaiian folk lore.

TIME-LIFE ENCYCLOPEDIA OF GARDENING SERIES, edited by James Underwood Crockett and editors of Time-Life books. In every case the volumes are profusely illustrated in color. The individual volumes are distributed by Little, Brown & Co., Boston, Mass. Library and school edition, by Silver Burdett Co., Morristown, N. J. 07960. Five volumes were reviewed in the 1972 PLANT LIFE. The following six additional volumes were published in 1972.

6. FOLIAGE HOUSE PLANTS. 1972. Pp. 160. Illus. $6.95. The subject is considered under the following headings: (1) a world of greenery at home; (2) the advantages of tender and loving care; (3) helping your plants to multiply; (4) the fascinating family of cacti and succulents, and (5) an encyclopedia of foliage plants. Highly recommended.

7. PERENNIALS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under the following headings: (1) the flowers that bloom year after year; (2) planting and caring for perennials: (3) propagating new plants for your garden, and (4) an encyclopedia of perennial and biennials. Highly recommended.

8. BULBS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.75. The subject matter is grouped under the following headings: (1) Flowers for all climates, all seasons; (2) the flamboyant history of bulbs; (3) the bulbs that bloom in the spring; (4) summer's grand parade of color; (5) plants for fall winter bloom; and (6) an illustrated encyclopedia of bulbs. Highly recommended.

9. FLOWERING SHRUBS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under following headings: (1) Bargains in beauty; (2) choosing, planting and

PLANT LIFE LIBRARY—continued on page 52.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

1. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Mr. W. D. Morton, Jr., Emeritus Registrar, 3114 State St. Dr., New Orleans 25, La.

...., Registrar, ...

Mr. Charles Hardman, Associate Registrar, Box 936, Temple City, Calif. 91780

Correspondence about the registration of plant names should be sent directly to the Registrar, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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Mrs. B. E. Seale, Chairman
4000 Stanford St., Dallas, Tex. 75225

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Official Amaryllis Judging Instructors

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The Chairman and Secretary of the Council also function as Official Instructors.

Examinations.—Those desiring to take the examination for the Official Amaryllis Judges Certificate, should preferably apply to the Official Instructor for details, See Plant Life Vol. 27, 1971, Pickard Study Course, pages 22—27.

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. **THE GENERA OF AMARYLLIDACEAE**, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. **LINEAGICS,** by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

COMPLETE SETS **OF HERBERTIA:**

Vols. 1-5 (1934-1938), $30.00, postpaid.
6-10 (1939-1943), $30.00, postpaid.
11-15 (1944-1948), $30.00, postpaid.

1-15 (1934-1948), $85.00, postpaid.

SINGLE VOLUMES OF HERBERTIA:

Single volumes of HERBERTIA (1934-1948), when available may be purchased at $7.00 per volume postpaid.

Only a very limited number of sets, and odd single volumes are available. The price quotations are subject to prior sale.

(B) PLANT LIFE, including numbers on various plant subjects, 1945 to date, and the **Second Series** of **HERBERTIA**, or **AMARYLLIS YEAR BOOK,** 1949 to date. It should be noted that the numbers of **HERBERTIA** of the **second series,** beginning in 1949, are in every way equivalent to those of the first series, and are devoted exclusively to the amaryllids.

A limited number of volumes of **Plant Life,** including **Herbertia,** second series, are available, all quotations subject to prior sale.

COMPLETE SETS OF **PLANT LIFE:**

Vols. 1— 5, 1945-1949, $ 25.00 postpaid
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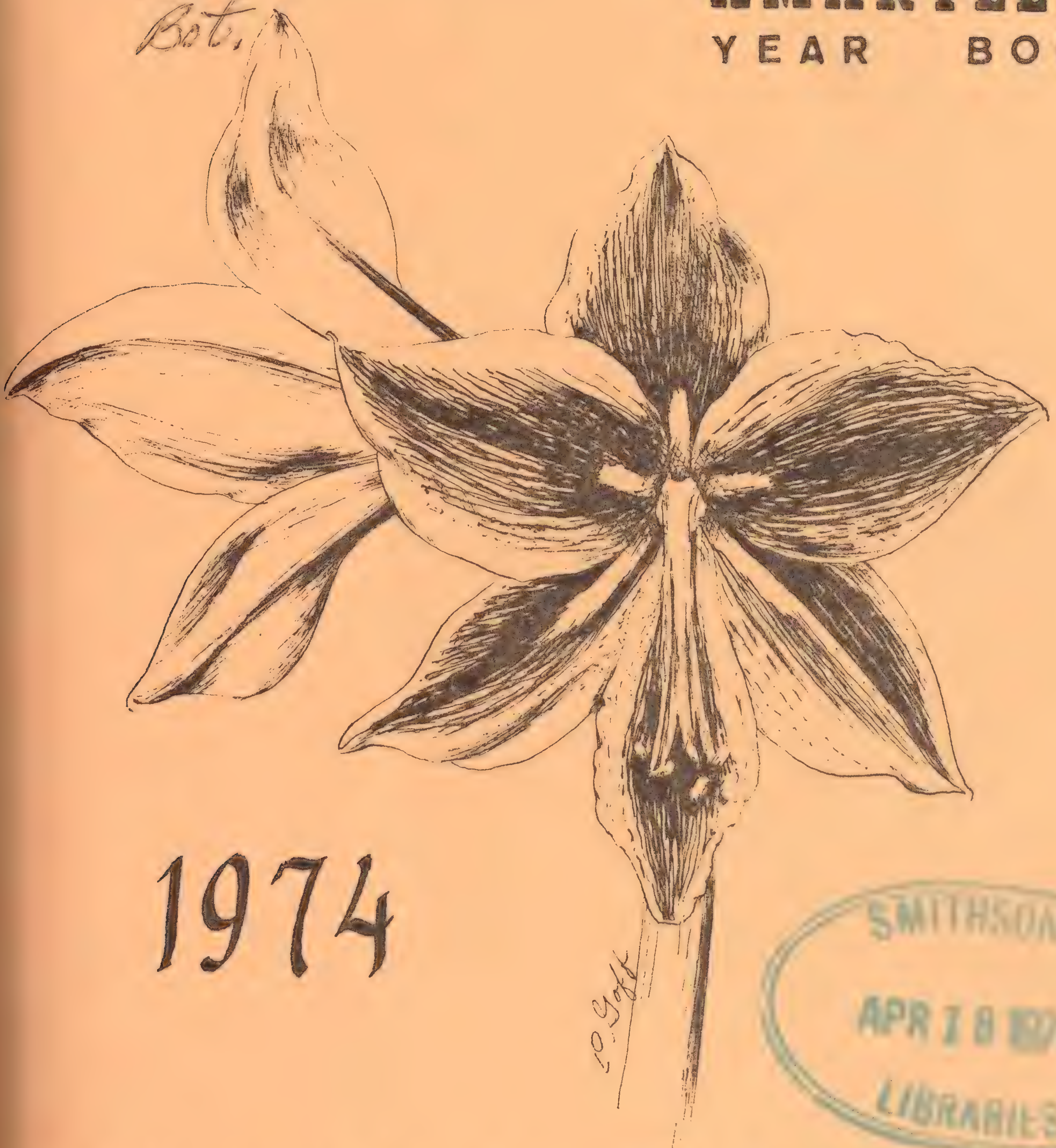

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Amaryllis leopoldii T. Moore (1870) with the most regular flower in the genus; first collected by Richard W. Pearce, who referred it to Peru; lost under cultivation; rediscovered by the late Dr. Martin Cardenas in the mid-1960's to 1971 in Bolivia, its true natural habitat.

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1974

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Nerine clone 'Scarlet O'Hara' (Traub, 1973), leaves produced after the flowers; scape 10″ high; umbel 10 or more-flowered; fls. upright, color intense scarlet (HCC-19) self, floret 4.5 cm. across face, tepals 2.5 cm. long, very slightly ruffled, otherwise regular, stamens 4.5 cm. long.

AMARYLLIS JUDGE'S CERTIFICATES—continued from page 28.

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BIOGEOGRAPHY: AN ECOLOGICAL AND EVOLUTIONARY APPROACH, by C. Barry Cox, Ian N. Healey and Peter D. Moore. Halstead Press, Div. John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. viii + 184. Illus. Biogeography is concerned with the distribution of organisms in space and time. "This book outlines the basic principles and interactions of ecological and evolutionary biology and geography in such a way that students whose main study lies within either subject will readily understand them—even if they have had little or no previous biological knowledge. Throughout the emphasis is placed on the role of man as an increasingly dominant influence on the ultimate fate of the rest of the fauna and flora. The particular lessons to be learned from island faunas and floras are outlined. A brief account is given of the process of continental drift, and of the way in which the present patterns of life have gradually evolved. Finally, attention is drawn to the necessity of conserving our environment and the genetic resources of the world's faunas and floras. Very highly recommended to all interested in ecology, and the conservation of national resources.

PLANT ECOLOGY: PLANTS, THE SOIL AND MAN, by M. G. Stafelt. Translated from the Swedish by Margaret S. Jarvis and Paul G. Jarvis. Halsted Press, Div. John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. xi + 592. Illus. Paperback $17.50. The late Prof. Stafelt was one of the pioneers in ecological research, and "he was acutely conscious of the delicate balance of nature and how easily man can upset it . . . . The central theme of the book is the balance between the production of vegetation and the crops taken from it by mankind. Starting with a general discussion of the plant environment, it leads through descriptions of the various environmental factors, soil, water, litter, etc., to discussions of their interrelationships and interactions with vegetation. Finally, in a discourse on the influence of man on all these things, Stafelt puts forward a strong plea for urgent conservation measures not only for plant life of this planet but also for soil on which it depends." Very highly recommended to all interested in ecology and the conservation of natural resources.

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PLANT LIFE, VOL. 30, NO. 1, January, 1974

AMARYLLIS
YEAR BOOK
1974

Year Book of
The American Amaryllis Society
41st Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
THOMAS W. WHITAKER
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

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PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the beautiful cover design featuring *Amaryllis leopoldii* recently re-discovered in Bolivia, its true habitat, and not native to Peru as alleged by Pearce in 1865.

This 41st annual edition of HERBERTIA, THE AMARYLLIS YEAR BOOK, is dedicated to Sr. Pierfelice Ravenna of Santiago, Chile for his outstanding contributions toward the advancement of the Amaryllidaceae and Iridaceae. Since the mid-1950's he has consistently labored in this field making plant collecting trips in South America. He has interpreted the plants collected leading to the discovery of many new species and some genera which he has published in scientific journals in South America, and in PLANT LIFE in North America. In the present issue of PLANT LIFE, he contributes an excellent article, the 6th in a series, on ''Contributions to South American Amaryllidaceae''. For his outstanding contributions to science he has received the WILLIAM HERBERT MEDAL of the American Plant Life Society.

In the present issue of the Amaryllis Year Book, Sr. Ravenna favors us with an interesting autobiography.

Various important articles on Amaryllis appear in the present edition. The confusion about the habitat of *Amaryllis leopoldii* is cleared up. Dr. Cage reports on true-breeding *Amaryllis* lines; Dr. Bell reports on stomatal size and polyploidy in *Amaryllis,* and tetraploid *Amaryllis evansiae.* Mr. Narin contributes a review of *Amaryllis* chromosomes; and Dr. Nowicki and colleagues contribute articles on mosaic virus disease, and its elimination in *Amaryllis.* Mr. Allan Rogers and the Shannons write about their interest in *Amaryllis.* Mr. Kendall reports on his Amaryllid experiences in Kansas.

Mr. Manning reports on a possible Amaryllis-Sprekelia cross. Mr. Ellenbecker writes about *Hymenocallis azteciana* and the propagation of *Haemanthus* by cuttage. Mr. Hardman reports on the repotting of the Greenoaks Nerines, and presents his annual report as Chairman of the Nerine Committee for 1973. Mr. Tisch gives the annual report of the Zephyrantheae Committee, and Mr. Buck presents his yearly report of the Daylily Committee. There are reports on the regional Amaryllis shows, and still other important articles as shown in the table of contents.

The members of the Society were saddened by the death of Dr. Martin Cardenas Hermosa of Cochabamba, Bolivia in 1972, and Mr. Aleck Korsakoff in 1973. They will be missed by all. Appropriate In Memoriam notices appear in the present issue.

Contributors to the 1975 issue of the AMARYLLIS YEAR BOOK are requested to send their articles by August 1, 1974, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.*

December 15, 1973,
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Thomas W. Whitaker
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page vi.

NEW YORK TIMES BOOK OF HOUSE PLANTS, by Joan Lee Faust. Quadrangle Books, 330 Madison Av., New York, N.Y. 10017. **1973.** Pp. vi + 274. Illus. $9.95. This outstanding new book on house plants will be welcomed by indoor gardeners generally. After a brief introduction, the care of house plants is discussed, including the requirements, for light, moisture, air, temperature and humidity requirements, soil and fertilizers, potting and pruning. These discussions are followed by a garden calendar, indicating the gardening operations for each month of the year. This is not all—a section is developed to "Plants to Grow," from **Achimenes** to **Wax Plant (Hoya)**, and with an added selection of unusual plants. Then, digging deeper into house plants, the author discusses gardening under lights, indoor gardens, office plants, bottle gardens and terrariums, hanging plants, topiary art, standards, forcing bulbs, fun for children, and propagation. An appendix about house plant societies, plant suppliers and a glossary, list of Latin and common names, and an index complete the volume. Highly recommended to all gardeners.

HOUSE PLANT IDENTIFIER, by Helmut Bechtel. Sterling Publ. Co., 419 Park Av. So., New York, N.Y. 10016. **1973.** Pp. 256. Illus. Trade Ed. $3.50; Library Ed. $3.69. The author, a well-known nature photographer, shows how to identify 47 important plants, and besides each, provides a full-page illustration from a color photograph. The reader has but to page through the book to locate the illustration which matches his living plant. In each case he provides the scientific, name description, and cultural directions. Highly recommended.

TINY LIVING THINGS, by Edouard Cauvin. Sterling Publ. Co., 419 Park Av. So., New York, N.Y. 10016. **1973.** Pp. 104. Illus. Trade ed. $3.50; Library ed. $3.69. This is one of the volumes in the Sterling Nature Series and is intended for young readers, and also for older folk who wish to study nature. The use of the microscope brings the "unusual, rare, beguiling, magical out of the wing of the moth, the eye of the dragon fly, or a spider's web" and so on, and in this way one may explore a world in miniature with journeys indoors and outdoors. This fascinating, easy to read text together with 100 full and half page close-up photographs makes this an outstanding nature book. Highly recommended.

ECOLOGY: CYCLE AND RECYCLE, by Grace Holden Kolbas. Sterling Publ. Co., 419 Park Av. So., New York, N.Y. 10016. **1972.** Pp. 168. Illus. $7.95. This is the 5th volume in the Basic Biology in Color Series. The book is profusely illustrated in color, and is calculated to unfold gradually the role of ecology in the life cycle of living things. The chapters are devoted to food chains, producers and consumers, secondary consumers, decomposers, food webs, pyramids, habitat, niche and heredity, plant successors, ecosystems and biogeography, the future of agriculture, and conservation and pollution. This fascinating text was prepared for use in high school biology departments with new ecology courses. Highly recommended.

PLANT LIFE LIBRARY—continued on page 5.

DEDICATED TO

PIERFELICE RAVENNA

PLANT LIFE LIBRARY—continued from page 4.

VEGETATION OF NEW JERSEY: A STUDY OF LANDSCAPE DIVERSITY, by Beryl Robihaud and Murray F. Buell. Rutgers University Press, 30 College Av., New Brunswick, N.J. 08903. **1973.** Pp. xii + 340. Illus. $12.50. This timely informative and adequately illustrated book by two outstanding authorities on the ecology of New Jersey is based on a sound scientific basis and is in addition a delightful volume to read. "The book begins with a description of New Jersey as an ecosystem—its geology, topography and soil, climate, plant-plant and plant animal relationships, and the influence of man on the environment. Maps show geologic, soil, and climatic zones of the state, and the impact of man's settlement on forest cover. Vegetation—the total plant cover—is composed of different types of species of plants that grow together in groups called plant communities. Twelve types of plant habitats are distinguished in New Jersey and the plant communities in each are described. Photographs illustrate plant life in related groups and as individual specimens. The authors warn that it will not be easy to conserve for future generations the diverse natural vegetation that exists today." It is highly desirable to have similar studies for each of the remaining 49 states. It is hoped that this timely book will serve as a model. Very highly recommended to all citizens in the hope that this will contribute toward the conservation of our natural resources.

PLANT LIFE LIBRARY—continued on page 14.

HERBERT MEDALIST—PIERFELICE RAVENNA

PIERFELICE RAVENNA

An autobiography

According to my father, I was born on a beautiful spring morning on March 8, 1938 at eight o'clock in the ancient City of Bologna, Italy. I am the second child, after my elder sister, Grazio Enrico Ravenna, and Luciana Sonino Ravenna.

The first years of my life were endured under conditions of injustice and persecution against people of the Jewish faith. It was the beginning of the War . . . In 1941, since the humiliations were no longer endurable, my parents decided to immigrate. Argentina was the country chosen, and thus I spent the rest of my childhood there, and there carried on my regular school studies.

During the years of the elementary studies, I used to say that I would be an engineer. In fact, in my walks to school and return, I often stopped fascinated at any building under construction and talked with the bricklayers regarding the details of building. However, while studying botany in the first year of the secondary school, I discovered the wonderful world of plant life. Prof. Pinto used to encourage his pupils to observe and collect living plants. These greatly impressed me since I always looked for beauty. I was thirteen years old. In subsequent years, my interest in plants became so intensive that it even displaced the pleasure of hearing classic music.

I began then to collect seeds of any interesting plants along the railroad tracks or in gardens, and to grow them. Sometimes I even missed classes at school in order to go far afield to find wild *Iridaceae.* This plant family became my chief interest ever since I saw for the first time the charming flowers of *Iris japonica.* It was on one of these occasions that I "played hookey" in order to search the Paranà Delta for the beautiful *Cypella herbertii.* This desideratum was fortunately found and introduced in my plant collection. It was only later that I also became interested in the *Amaryllidaceae.*

When I was fifteen, I discovered by chance the Faculty of Agronomy and its small Botanical Garden. The latter was scientifically arranged in order to serve for the purpose of teaching. This was a lucky event! I entered and then looked up the collection of the *Iridaceae,* but was greatly dissapointed—most of the plants there were not labeled to show their identity. Looking around, I saw a man wearing a white apron who was pruning shrubs. "Why", I asked, "are these plants not named?" His reply: "Bulbous plants are generally difficult to identify when dry, and for this reason no botanist wants to study them." He brought me to his office and we had a delightful discussion on botany. This man was the late distinguished Professor Lorenzo R. Parodi. Since that time I had often visited with him, and I began the systematic study of the *Iridaceae,* especially the genus *Sisyrinchium.* Prof. Parodi indicated to me the Institute de Botánica Darwinion as the best place for the improvement of my knowledge about the last named genus. Since that time I became a frequent visitor to that Institute, which has the richest botanical library in Latin America.

In 1955, during a trip to Italy, I visited several botanic gardens and had the opportunity of collecting some European Irids. On the way back, at the seaport of Salvador, Brazil, I was impressed by the beauty of *Neomarica sabinii* and *N. coerulea*, commonly grown in gardens there.

The next year I entered as a student in the Faculty of Agronomy of the University of Buenos Aires. When I was in second year of my studies, Prof. Parodi encouraged me to present my first discovery at the Meeting of the ''4as Jornadas Argentinas de Botánica''. This paper was entitled, ''*Catillandra* génere nueve de Iridáceas''. This was an unforgettable experience since I became acquainted with several botanists, including some from other countries.

Later, in 1959, I obtained a scholarship at the Institute de Botánica Agrícola (I.N.T.A.) and worked for a year in the Herbarium of the Argentine Museum of Natural History. The access to large collections of Herbarium specimens and a valuable library at this institution, provided the opportunity for increasing my knowledge of the *Iridaceae.* This experience convinced me that only the examination of living plants, in the wild or under cultivation, would provide information on the generic limits and the proper evaluation of the morphological characters in this family. With this idea in mind, I undertook some short trips to the Province of Misiones, in the northeast, and the Uruguay Republic; and I planned my first long trip to the Andes. I was twenty-one years old and had an ardent enthusiasm. Unfortunately, no aid could be obtained for this purpose from the botanical institutions. In spite of this, I decided to pursue the project with my own limited means.

Previously, I had the opportunity of knowing Mr. Salvador Magno, a fine artist, whose speciality is the illustration of native animals and plants. He is also a distinguished collaborator in the natural sciences. Insects and plants have been named in his honor (e. g., *Habranthus magnoii*). Since that time a mutual cooperation and a close friendship has existed between us. Actually a large part of my own studies on plants was stimulated by his encouragement and help. Other friends that collaborated by collecting bulbs in the field were Dr. John Christie, an enthusiastic amateur, and the enthomologist Antonio Martínez (see *Habranthus martinezii*), both from Buenos Aires.

In January 1960, I left Buenos Aires on a trip to the North. The explorations began in the Province of Córdoba, Argentina, and ended in the Department of Piura, Peru, nine months later! The bulbs collected were sent to Mr. Magno, who cared for them during my absence. In Peru, I was impressed by the beauty and amazing diversity of the *Amaryllidaceae,* and since that time my interest in this great group has greatly increased. Many species of *Iridaceae* and *Amaryllidaceae* were collected and introduced for further study. The Irids flowered wonderfully in culture the same year and in 1961, but gradually died out in successive years. Some observations made on this trip still remain to be published.

In December 1961, I journeyed again to northwestern Argentina and northern Chile. On this trip I collected several new *Habranthi-H, niveus, H. andalgensis, H. catamarcensis, Famatina saxatilis;* and *Tigridia philippiana.*

In November 1962, I again left Buenos Aires, this time for a twenty days' journey to Brazil, but only returned after thirteen months! The great, rich flora of the marvelous country detained me for about eight months and a half. On the same trip I explored Ecuador, Columbia, Costa Rica, Guatemala, and Mexico. Many new species of the genera *Trimezia, Pseudotrimezia, Calydorea, Alophia, Tigridia, Nemastylis,* as well as several new genera in the *Iridaceae,* and species of *Griffinia, Amaryllis* and others, in the *Amaryllidaceae,* were discovered during that trip. About ten additional short trips to Brazil to new areas were made in six subsequent years. In this latter country, I was assisted in several occasions by Mr. Guido F. J. Pabst, Director, Herbarium Bradeanum, Río de Janeiro.

One of the main objectives of these trips was to collect in their original habitats as many species as possible. This would fix the habitats of the species collected in order to correct misinformation in the literature due to carelessness in making records in the past. It has been necessary to follow the routes of several plant explorers of the last century, such as Gardner, Mandon, Martinus, Mathews, Pringle, Spruce, and others, and attempt to find the present day successors of the populations that they found.

My first article was printed in 1964, and was entitled ''Notas sobre Iridaceae''. Twelve new species from different parts of Latin America, and a number of new combinations were published in that work. Some of the most attractive new species described were *Cipura flava* (Brazil, Venezuela), *Mastigostyla mirabilis,* (Argentina), *M. major* (Peru), and *Tigridia tepoxtlana* (Mexico).

In 1965, I received a first letter from Dr. Traub inquiring about my Amaryllid collection, and my intention concerning it. He was apparently informed by the late Wyndham Hayward, who had been my previous correspondent, that I had some interesting species under experimental culture. Since that time, a steady exchange of information has been maintained. Dr. Traub encouraged me to publish on the *Amaryllidaceae* by offering space in PLANT LIFE for this purpose. He has greatly stimulated my research in the latter family by sharing his wide knowledge of this great group. I also appreciate very much his human quality and his friendship.

The first article of my own that was published in *PLANT LIFE* was entitled *''Nothoscordum felipponei,* its status and chromosomes'', which appeared in 1967. In the same year the first of my ''Contributions . . .'' was published in *Sellowia,* the Brazilian journal. The latter article included descriptions of several new species. Some of these are *Amaryllis aviflora, Hieronymiella aurea, Zephyranthes flavissima,* and *Z. stellaris.*

In 1969, I entered the Servicio Nac. de Parques Nacionales in order to collaborate on the ''Flora de la Región Andino-Patagónica'', which is edited by Prof. M. J. Dimitri. I was then intrusted with the monography of the Cruciferae for that work. In this capacity I needed to examine the type-material of the late great R. A. Philippi deposited in the Natural History Museum of Santiago, Chile. My initial stay at the Museum was to be a month and a half in length. However, this was long enough to meet and become acquainted with Senorita Cleo Valenzuela. We were married in August 1970, and make our home in the City of Santiago, Chile. I obtained a teaching position in the Universidad de Chile.

Casilla 21128, Sucursal 21,
Santiago, Chile,
June 11, 1973

MARTIN CARDENAS HERMOSA*
BOTANIST EXTRA-ORDINARY
1899—1973

This morning I have chosen to present to you an outline of the achievements of a remarkable individual, an outstanding botanist, a prolific contributor to our understanding of the Amaryllidaceae, and one of the most distinguished scientists yet produced in Latin America. I am speaking of Martin Cardenas Hermosa, (dropping of the mother's name is usual for Latin Americans with contacts in Europe and the United States). Dr. Cardenas was born of Indian parents in the city of Cochabamba, Bolivia, on November 12, 1899. He died February 14, 1973 at the age of 73, a victim of a malignancy of the prostate. Cardenas was a strong, active, ruggedly handsome man, much larger, more active, and younger appearing for his age than most Bolivians. Although, he enjoyed the company of attractive women, he never married.

Botanically speaking, Martin Cardenas was truly a man for All Seasons. He made important contributions to the taxonomy and systematics of such diverse groups as mushrooms, succulents, cacti, and *Solanum,* particularly potatoes. In addition, he became *the* authority on the Flora of Bolivia. While his interest in the Amaryllidaceae was not aroused until the later years of his life, he collected and identified approximately one dozen new species of *Amaryllis.*

Dr. Cardenas was the author of many technical and popular articles about his specialities. On his own and in collaboration with colleagues, he was also the author of several books. One of the best known is the ''Manual of the Economic Plants of Bolivia'', published in 1969. According to his good friend Sr. Jose Marquez, a lawyer, Cardenas had just completed a manuscript at the time of death with the title, ''Recollection of a Naturalist; Travels in the Andes, Argentina, United States and Europe''. This account of his travels, research, and cooperation with other scientists has just been published in Cochabamba, Bolivia. He had made plans or actually commenced work on monographs of the Bolivian species of *Amaryllis* and the Bolivian species of wild potatoes.

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* Substance of a lecture delivered to the Southern California Amaryllis and Hemerocallis Club on October 20, 1973, at the Los Angeles State and County Arboretum, Arcadia, California.

Cardenas as a youngster made normal progress thru the primary and secondary schools of his native city, graduating in 1917. In 1918, he entered the Universidad de San Andres, in La Paz, Bolivia. Here he enrolled in the Instituto Normal Superior, choosing the section of the Biological Sciences for his major. In 1921, just 4 months prior to graduation from this University he was ordered by the Bolivian Government to join the Mulford Biological Expedition whose purpose was to explore the Northeast corner of Bolivia. This vast and still poorly known territory includes the headwaters and drainage basin of the Rio Beni, an important tributary of the Amazon. This opportunity to join and work with the personnel of the prestigious Mulford Expedition in a botanical exploration of a portion of the Amazon Basin had profound effect on the career of this young Bolivian botanist. In fact, it seemed to be a turning point, adding purpose, and direction to his life.

The goal of the Mulford Expedition, which was in the field from 1921 thru the greater part of 1922, was to explore the drainage area of the Rio Beni, primarily for plants of potential importance for the pharamaceutical industry. The Mulford Expedition was probably the most famous of the plant hunting expeditions sent to Latin America during this century. Certainly it received the most publicity both before it departed, and after it returned, of any comparable endeavor. The data concerning the collections, observations, and experiences of the Expedition have been recorded in numerous technical reports, and several books. Of the books, ''Black Waters and White'', must have sold as many as ten thousand copies or more.

The personnel of the Expedition included some well-known scientists, notably Professor H. H. Rusby, the Leader, who was an experienced Latin American explorer, and was Dean of the School of Pharmacy, Columbia University; Dr. William Mann, a brilliant entomologist, who later became director of the National Zoo, Washington, D.C.; Dr. O. E. White, botanist and geneticist, and future Director of the Blandy Experimental Farm, University of Virginia; and several others. Cardenas made the most of these contracts, and these people were the source of a number of lifetime friendships.

On his return from the Amazon with the Mulford Expedition, Cardenas was awarded the degree of Professor of Biological Sciences, and was immediately made Lecturer in this Department at the Instituto Normal Superior at La Paz, where he served until 1930. His main task in this position was to familiarize students with the rich Bolivian flora. From 1932 to 1933 he was Professor and Director of Natural Sciences at the Colegio Nacional in the city of Potosi. Potosi is located in the high Andes. This assignment provided an opportunity to study and collect plants at high altitudes, an opportunity that was eagerly seized upon by the young botanist. From 1934 to 1935, he served with the Sanitary Corps of the Bolivian Armed Forces engaged in the Chaco War.

In 1935, Cardenas was sent by the Bolivian Government to Washington, D.C. to study the possibility of improving the culture of *Chinchona* specias (quinine) in Bolivia. Cardenas had considerable experience with *Chinchona* while exploring the forests of the Lower Amazon Basin. With this background, he was the logical choice to investigate quinine production and processing for his government.

In 1937, Cardenas was elected to the position of Rector (President) of the Universidad de San Simon, now called the Autonmous University of Cochabamba, in Cochabamba. He held this position until he resigned in 1946, but he continued with his teaching duties at the University, lecturing in botany, economic botany, genetics and plant pathology. He retired from the University about 1969. Thereafter, he devoted himself exclusively to botanical activities and travel abroad.

Cardenas was a widely traveled individual, not only in Latin America, but in the United States and Europe as well. He visited most of the countries of Latin America in pursuit of his botanical specialties. He represented Bolivia at three Latin American Botanical Congresses, and he made several trips to the USA, once as the guest of our Department of State. Three trips were made to Europe to study in herbaria, and to work with specialists with similiar interests. In 1966, he attended and presented a paper at the 37th Congress of Americanists at Mar del Plata, Argentina. It was at this Congress that I first met Cardenas. He urged me to return with him to Bolivia for the purpose of collecting *Amaryllis.* As it turned out I should have accepted the invitation because circumstances prevented me from returning to South America until 1970. At this late date Dr. Cardenas was in declining health, and he was not able to accompany us on all of our collecting trips. He did, however, send with us his student and assistant, Ing. Elias Meneses.

Dr. Cardenas received many honors. He was designated Doctor in Sciences, *''Honoris causa''* by his University in 1937. He was the first recipient of the Interamerican Agricultural Medal awarded by the Interamerican Institute of Agricultural Sciences at Turrialba, Costa Rica. He received the Mary Soper Pope Medal, awarded by the Cranbrook Institutes of Sciences, Bloomfield Hills, Michigan. He was elected a Corresponding Member of the Botanical Society of America, a Life Member of the Potato Association of America, and a Foreign Member of the Linnean Society of London. One of the honors in which he took the most pride was the William Herbert Medal awarded to him by the American Plant Life Society in 1967 for his work with *Amaryllis.*

It was a curious fact that Cardenas was first stimulated to take a serious interest in *Amaryllis* by a visit from the late Professor Ira S. Nelson of Southwestern Louisiana State University, Lafayette, in 1954. Nelson was an experienced plantsman, and he had the knack of making Horticulture an exciting experience for anyone with whom he came in contact. Nelson and Cardenas made three trips, one in the vicinity of Cochabamba in 1954, and in October 1958, a short trip to San Ignacio de Velasco, and in November, 1958 a more extensive trip thru the Bolivian yungas. Much material of value for American gardens was collected on these trips. Our own J. L. Doran, along with H. L. Bush collected *Amaryllis* with Dr. Cardenas on the new road which borders on the river Bopi in the south yungas of Bolivia in September of 1970.

Considering his multitude of other activities, Cardenas' taxonomic achievements are truly prodigious judged by any set of standards. He published 4 new genera and 120 new species of the Cactaceae of Bolivia, 20 new species of wild potato *(Solanum)*, along with about a dozen new species of *Amaryllis* mentioned earlier. He collected about 6500 numbers of Bolivian plants for his Herbarium Gardenasianum, as he called his private collection.

Martin Cardenas served American horticulture well, and indeed the entire world, by enhancing our gardens with a generous sample of the rich and varied flora of Bolivia. Thru his efforts we know that Bolivia is copiously endowed with species of *Amaryllis*, and is probably the geographic center of distribution for the genus. Unfortunately, there is no one in Bolivia with the talent, energy, ability, and experience to carry on his work. He willed his herbarium, books and botanical records to the University of Tucuman, located at Tucuman in Northern Argentina.

Martin Cardenas was friend and advisor to innumerable horticulturists, and botanists of all persuasions and from many countries. The world of plant sciences will be the poorer for his passing.

Acknowledgements: In preparing this article I have received invaluable help from several individuals, notably Dr. Hugh C. Cutler, Missouri Botanical Garden, St. Louis, Missouri; Sr. Jose Marquez, Cochabamba, Bolivia; and Mr. L. J. Doran, Burbank, California. Without the assistance of my daughter, Mrs. Gilbert Rogers, who translated Sr. Marquez's notes and other materials, this account of the life and work of Martin Cardenas would not have been possible. I am much indebted to all of these people for their unselfish assistance.—*Thomas W. Whitaker*

IN MEMORIAM—ALEK KORSAKOFF, 1894-1973

Some years ago, an article on Alek Korsakoff in the Fairchild Garden Bulletin described him as "wonderfully extroverted, like a character in a Dostoyevsky novel." True—but more than that he was a fine horticulturist, a generous human being and a deeply religious man.

One may find it difficult to understand, after reading Alek's autobiography in the 1969 issue of Plant Life, how he could settle down to the comparatively quiet life of a horticulturist. But to him the growing and blooming of plants was a happy adventure. When he was sexton of the Miami City Cemetery, he converted it into a beautiful botanical garden of rare shrubs and trees. Botanists visited it and garden clubs held their meetings there.

When Fairchild Garden (in Miami) was established, he became an active member, contributing not only plants but also a large sum of money in life memberships.

His years in Jacksonville were especially happy. He shared a large greenhouse with his wife Meta. In his half he grew thousands of plants, including the Amaryllids which were his favorites.

Alek kept up a vast correspondence with friends in all parts of the world. One had only to express an interest in horticulture and instantly there would be a warm, friendly letter, followed by boxes of plants. Alek produced an enormous number of hybrids, particularly among the Amaryllis and rain lilies, and periodically he would send boxes of bulbs and plants to his friends. He believed, too, that friends should be shared and took great delight in having them meet, via letters or in person.

A devout Christian, his faith never wavered even when he learned that he had terminal cancer. I am sure he would not wish me to dwell on his illness. Rather, I think he would wish me to pay tribute to his wife Meta for her devotion and care, and to thank his many friends who continued to write to him during the long months when he was helpless and unable to communicate with them.

Many of us will miss his exuberant letters. Only a year ago he wrote ''My half of the greenhouse is 'ablooming' ''. May his plants bloom for us too.—*Mrs. F. J. Pahls*

PLANT LIFE LIBRARY—continued from page 5.

LECTURES ON PHOTOMORPHOGENESIS, by H. Mohr. Springer Verlag, 175 5th Av., New York, N.Y. 10010. **1972.** Pp. xii + 237. Illus. Paperback $14.80. The auther points out that the discovery of the reversible red far-red control of plant growth and development and subsequent **in vivo** identification and isolation of the photoreceptor pigment, **phytochrome**, constitutes one of the great achievements in modern biology. This important book presents a summary of the present state of the phytochrome concept in so far as it is required to understand developmental plant physiology (photomorphogenesis). This book is must reading for all plant physiologists. Very highly recommended.

RESIDUE REVIEWS: RESIDUES OF PESTICIDES AND OTHER CONTAMINANTS IN THE TOTAL ENVIRONMENT, edited by Francis A. Gunther and Jane Davies Gunther. Vol. 44 (1972, Pp. vii + 192); Vol. 45 (1973, Pp. vii + 168); Vol. 47 (Pp. vii + 198); Vol. 48 (1973, Pp. vii + 168). Springer Verlag, 175 5th Av., New York, N.Y. 10010. $16.50 per volume. These volumes are devoted to the study of residues of pesticides and other contaminants in the total environment and are of importance to everyone on planet earth. Since pest-control chemicals and food additive chemicals are essential to adequate food production, manufacture, marketing and storage, it is evident that without surveillance and intelligent control some of these persist in our foodstuffs. These residues could at times conceivably endanger the public health. In these four volumes contributions on the residue of pesticides and other food contaminants are published in the order in which they are received, and the mass of information is indispensible to all who are concerned with problems caused by the use of pesticides. These volumes are highly recommended to all who are engaged in the production, storage, marketing, regulation and consumption of foodstuffs.

PLANT LIFE LIBRARY—continued on page 80.

1973 HERBERT MEDAL PRESENTED TO DR. CESAR VARGAS CALDERON

Paul Ferree, Agricultural Attaché, Foreign Agricultural Service, U.S. Dept. Agric., at Lima, writes under date of Oct. 10, 1973, that at a municipal civic ceremony in the ancient capital of the Inca Empire, the 1973 WILLIAM HERBERT MEDAL was presented to Dr. César Vargas Calderón by the Lord Mayor of Cuzco, Peru, Senior Humberto Muñiz Polo in behalf of the American Plant Life Society. The arrangements in Cuzco were made through the Instuto Cultural Norteamericano with the actual presentation being made at an appropriate ceremony on Aug. 3, 1973.

Dr. Vargas is Emeritus Professor of Botany, University of Cuzco, and Director of the Herbario Vargas. He received the HERBERT MEDAL for his outstanding contributions in the field of plant science, particularly the Amaryllidaceae.

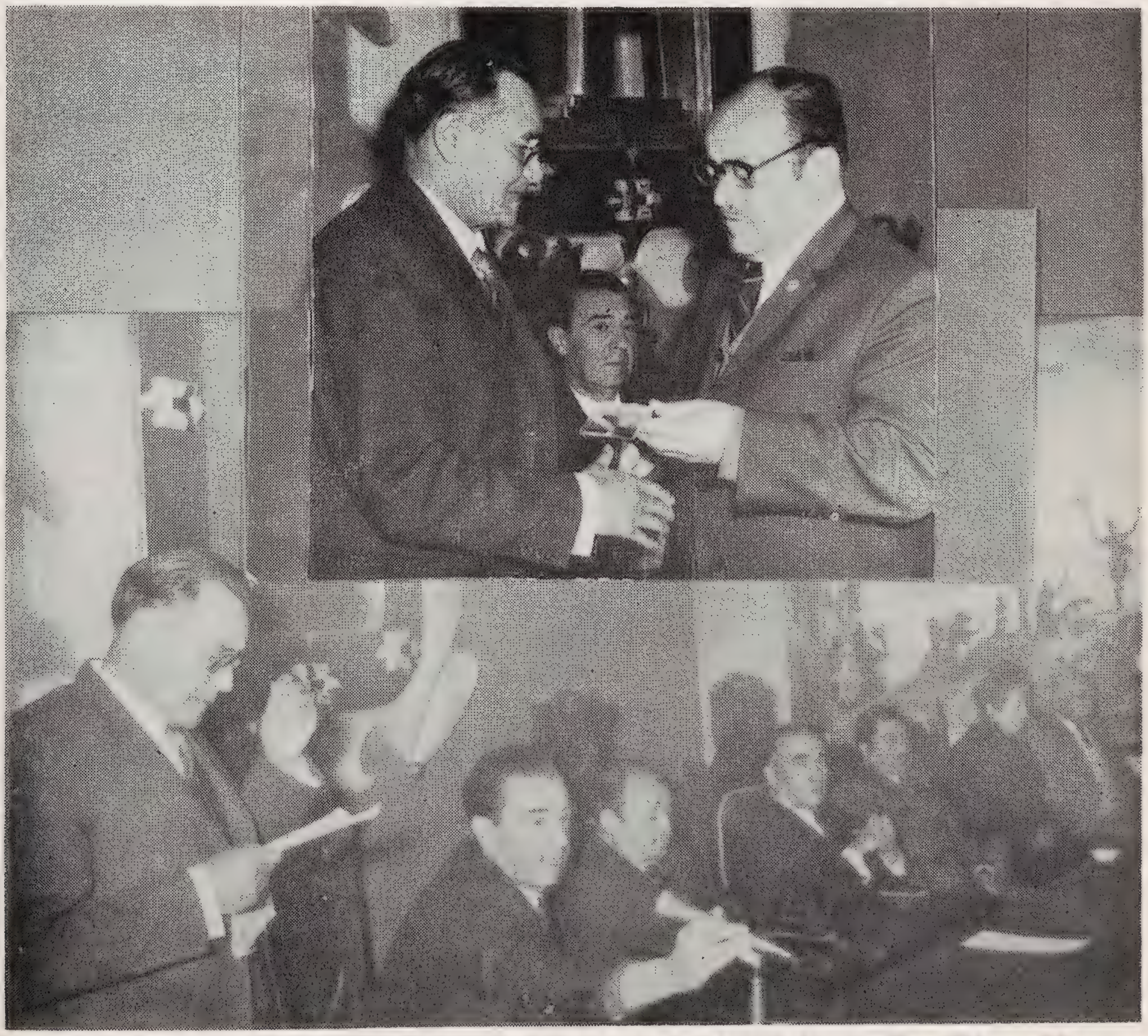

Fig. 2. Presentation of the 1973 HERBERT MEDAL to Dr. César Vargas Calderón at a civic municipal ceremony at Cuzco, Peru, Aug. 3, 1973.

Upper, The Lord Mayor of Cuzco, Senor Humberto Muñiz Polo is shown presenting the HERBERT MEDAL to Dr. Vargas.

Lower, Dr. Vargas is reading his responding speech.

EDITOR'S MAIL BAG

We have received the sad news that Alek Korsakoff of Jacksonville, Fla., passed away at 11:40 a.m. July 26, 1973. His many friends will miss him. The members are referred to a brief biography which he contributed to the 1969 PLANT LIFE (Vol. 25: 14-21. 1969), and the In Memoriam notice in the present issue.

Mr. James M. Weinstock, 10331 Independence, Chatsworth, Calif. 91311 has been appointed Registrar of amaryllid names to succeed the late Mr. James Edward Mahan, of New Orleans, who passed away in 1972.

Good news has been received from Holland! The firm of Ludwig & Co., Heemstede and Leo Berbee, Lisse, have merged and the combined firm plans to resume the selling of Amaryllis bulbs directly to gardeners in the United States *at retail* in the fall. Those interested should write directly to Ludwig & Co., Heemstede, Holland.

Mrs. A. C. Pickard, writes under date of July 7, 1973, that she has moved to 1909 Alta Vista, Alvin, Texas 77511 which is only 26 miles from my former home in Houston. ''The city has grown so rapidly and traffic is a problem; so I decided to move out to a suburban home where I have a nice place to grow my Amaryllis collection away from the smog of the city.''

Mr. Allan L. Rogers, Director, Department of Animal Care, University of Oregon Medical School, 3181 S.W. Sam Jackson Park Road, Portland, Oregon has been appointed to the vacant position of Northwest Regional Vice-President. He contributes a brief note about his interest in Amaryllis to the present issue.

Mr. Beckwith D. Smith, 2036 Post Street, Jacksonville, Florida 32204 writes under date of September 27 that he had meningitis in April and May of this year, and subsequently had to go back to the hospital for appendix removal, but that he is now on the mend, though quite weak. His many friends will be praying for his speedy and full recovery.

Mr. W. D. Morton, Jr., Emeritus Registrar of Amaryllis Names, has recently moved to the new address, 819 7th Av., Prospect Park, Pa. 19076. He has recently had cataract operations on both his eyes; his sight will be somewhat impaired, but he will not go blind. Mr. Morton still has a keen interest in Amaryllis, and has ordered Amaryllis bulbs and will show the blooms to all his friends at his new home.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1973 AMARYLLIS SHOW SEASON

The 1973 Amaryllis show season began with the New Orleans Intra-Club Amaryllis all horticulture Amaryllis Show on March 31. This was followed in April by the Corpus Christi 1973 Amaryllis Show on April 7 and 8; the 1973 Houston Amaryllis Society Show on April 8; the Greater New Orleans Official All-Horticulture Amaryllis Show on April 14-15; the 1973 Greater Houston Amaryllis Show, on April 15; the 1973 Amaryllis Society of Alabama Show on April 21-22, and the 1973 Southern California Amaryllis Show on April 29-30. No reports were received from the Hattiesburg, Miss., Amaryllis Society, and the Baton Rouge, Ala. Amaryllis Society, but reports from these societies are expected for the 1974 season.

NOTE TO AMARYLLIS SHOW ORGANIZERS

It is important to designate some one to write a *brief* review of the official show, and to send this promptly to Dr. Hamilton P. Traub, Editor, Amaryllis Year Book, 2678 Prestwick Court, La Jolla, Calif. 92037. *Your plans are not complete until this appointment has been made.* Only in this way is a permanent international record of your show assured.

1973 NEW ORLEANS INTRA-CLUB AMARYLLIS SHOW

L. W. MAZZENO, JR.
944 Beverley Gardens Drive, Metairie, Louisiana

An added highlight to the Men's Amaryllis Club 1973 activities was the staging of our first Intra-club all horticulture Amaryllis Show on March 31, 1973 at the City Park Backer Room. Trophies were awarded to the two most outstanding plants. These were a 'Zenith', exhibited by Mr. L. W. Mazzeno, Jr. and an 'Apple Blossom', exhibited by Mr. A. T. Diermayer. Because of the success of this initial show, the members agreed to make it an annual affair.

This show was in addition to the regular show staged on April 14-15, 1973, which is reported separately below.

1973 CORPUS CHRISTI AMARYLLIS SHOW

MRS. CARL C. HENNY, *Corresponding Secretary,*
P.O. Box 3054, Corpus Christi, Texas 78404

I am glad to report that our Coastal Bend Amaryllis Society was able to have an Amaryllis Exhibit again this spring, in conjunction with the "Festival of Flowers" show which was held in our City Coliseum on April 7th and 8th, 1973. We had a display of 67 entries despite the fact that our city experienced one of its worst winters in many years. We received light snow and sleet during both January and February, but very little rain during the month of March. Therefore, many of our amaryllis bulbs failed to bloom until after our show date.

Registered and named Amaryllis entered were 'Picotee Red Lining', 'Bouquet', 'Winter Carnival', 'Maria Goretti', 'Apple Blossom', 'Sight Show', 'White Christmas', 'Margaret Rose', 'Dawning', 'Royal Dutch', 'Firefly' and 'Little Sweetheart'.

Mrs. Roy Hornberger received the Silver Bowl Award for her entry of 'Picotee Red Lining' which scored 97 points and for her entry of 'Margaret Rose' which scored 94 points and also received an Award of Merit from the American Amaryllis Society for her entry of these two specimens. She also received the greatest number of blue ribbons given in the Ludwig Registered and Named Amaryllis Sections.

Mrs. Bill M. Miller, non-member, received a Special Trophy for her entry of 'Royal Dutch' which scored 96 points; also an Award of Merit from the American Amaryllis Society for this same entry.

Mr. R. L. Retallack, club member, received a Special Trophy for his entry in the Breeders Class, Leopoldii type, which scored 97 points.

Mrs. Carl Henny, club member, received the "Achievement Trophy" for receiving the next greatest number of blue ribbons in the Ludwig Registered and Named Amaryllis classes.

Preliminary Commendation Awards, given by the American Amaryllis Society, were awarded to Mr. R. L. Retallack, Mrs. R. E. Marburger —for her entry in the "Breeders Class" which scored 96 points, and to Mr. E. P. Adams for his new cross-pollinated Leopoldii type amaryllis which scored 95 points.

Thirty-two blue ribbons, 11 red ribbons and 1 yellow ribbon were awarded entries in the exhibit. Mrs. E. T. Story, Mrs. R. H. Parkinson, and Mrs. Robert Arnold, National Accredited Amaryllis Judges, from San Antonio, Texas were here to judge our Exhibit.

1973 HOUSTON AMARYLLIS SOCIETY AMARYLLIS SHOW

MRS. A. C. PICKARD, *Official Show Chairman and Judging Instructor for Amaryllis Judging Schools*

The Houston Amaryllis Society presented its annual Amaryllis Show April 8, 1973. Regardless of adverse weather conditions, such as the extremely hard down pour of daily rain and cool days with late frost, we were fortunate to even be able to stage a flower show. therefore the show was void of the many tables of cut specimens in former years.

The annual presentation of the Houston Amaryllis Society show in this area in April for fifteen years makes it something many people talk to their friends about, the best publicity ever.

A show that consists of several parts always is more difficult to stage, but is more interesting. So it is with our show, which is planned with sections presenting the professional floral arrangements as a distinctive entry featuring the lovely Amaryllis florets.

Fig. 3. Houston Amaryllis Show, April 8, 1973. **Left,** Mrs. Clem Smith standing beside her exhibit of Amaryllis hybrid, 'Bouquet' (Ludwig) which received an award of Merit. **Right**, Mr. and Mrs. E. E. Koon at one table of their outstanding Educational Exhibit.

We are very fortunate to again have a well known professional leader in this section. This year Mrs. Ada Blankenship, a club member and Amaryllis Judge served as chairman of this division. As usual the educational exhibit under the leadership of Mr. and Mrs. E. E. Koon ''real King and Queen of the set up'', gave demonstrations on hybridizing, and culture of Amaryllis, and featured a large display of other members of the Amaryllis family.

It was amazing to see some beautiful potted specimens exhibited by the new members and to receive the awards and blue ribbons. Mrs. Clem Smith received the Award of Merit with potted plant, 'Ludwig's Bouquet'. Mrs. Vivian Johnstone received the high grade with cut specimen 'Ludwig Dazzler'.

Mrs. Ward Blair, president, and Mrs. A. F. Lagatski, vice-president and chairman, of the show and the whole Society feel that the show was very gratifying in spite of the inclemental spring weather.

The question often asked, how do you as a Society, sixteen years old, continue to put on the most interesting spectacle in the state? Well, the answer is—you have to grow quality, and have devoted members determined to set up the show in conformance to the American Amaryllis Society requirements. This makes it your show. Do you doubt it? Come and visit us next year; we'll be right back with the same old annual goal. Knowing—Growing—Showing and Sharing.

Fig 4. New Orleans 1973 Amaryllis Show. Three top winners—Dr. T. A. Calamari, Jr. **(left)**; Mr. A. T. Diermayer **(center)**, and Mr. H. H. Bowers, Jr., Show Chairman is holding the Ludwig Cup, and his prize winning 'Picotee Red Lining'. Photo courtesy **New Orleans The Times-Picayune.**

1973 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

MR. L. W. MAZZENO, JR., *944 Beverly Gardens Dr., Metairie, Louisiana*

The Men's Amaryllis Club of New Orleans staged its fourteenth annual all-horticulture amaryllis show over the weekend of April 14 and 15, 1973 at the Lakeside Shopping Center Mall in Metairie, La. The total display was striking and quite beautiful. The show was viewed by over a thousand people. Again, interest and enthusiasm ran high as evidenced by the fact that there were nearly 400 entries. Competion was open to the public who responded with about twenty percent of the entries, winning 56 ribbons and one Sweepstakes Award.

Mr. A. T. Diermayer, with a spectacular specimen of 'Picotee Red Lining' won the ''Best in Show'' rosette, the Ludwig Challenge Cup, the James E. Mahan Memorial Trophy, the Men's Amaryllis Club Trophy, and an Award of Merit.

Winner of the most awards was Dr. T. A. Calamari, Jr. He won the Robert Diermayer Memorial Trophy for the best specimen in the Breeder's Section (a 'Golden Triumphator' Seedling); The Amaryllis Incorporated Trophy for the best species amaryllis (an *A. evansiae*); the President's Trophy for the most blue ribbons won by a Club member; the Amaryllis Society of Baton Rouge Trophy for the best unnamed, unregistered single floret; the Laurence W. Mazzeno, Jr. Award for the outstanding gracilis specimen ('Fire Fly') and a Sweepstakes ribbon for the most blue ribbons in the named and registered sections.

Mr. E. M. Beckhan received the TAC Construction Co. Award and an Award for the best two-floret specimen.

Mr. Walter R. Latapie was awarded the Southern Seed and Popcorn Co. Trophy for the runner-up in the Breeder's Section and the Lester Laine Trophy for the best double flowered specimen—one of his own hybrids.

Other trophies were won by Mr. H. H. Bowers, Jr.—the D. H. Holmes Co., Inc. Award for the runner-up in the registered section; Mr. Emile P. J. Flauss—the Reuter Seed Co., Inc. Trophy for the best cut specimen; Mr. L. W. Mazzeno, Sr.—the Edward F. Authement Memorial Trophy for runner-up in the unnamed and unregistered section; and Mr. L. W. Mazzeno, Jr.—The Club Trophy for the named and registered Best Single Floret.

The show was ably planned and coordinated by the Show Chairman, Mr. H. H. Bowers, Jr. and Co-Chairman Mr. Robert Luckett, with generous assistance of all Club members. Mr. Al Diermayer handled the publicity in his usual superlative fashion. Included in the pre-show activities were the appearances by Club members on TV at five different times. Our thanks go to all who participated in the show and a special note of thanks to our Show judges and the members of the Amaryllis Society of Baton Rouge for their assistance.

1973 GREATER HOUSTON AMARYLLIS CLUB SHOW

MRS. SALLY FOX, *Corresponding Secretary*

1527 Castle Court, Houston, Texas 77006

Amaryllis Rainbow was a perfect theme for the Greater Houston Amaryllis Club's show held at the Houston Garden Center on April 15, 1973 since there were intermittent showers all during the show. However, we were pleased that those interested in amaryllis braved the elements and came to view the nice display of rainbow colors.

The show was judged by accredited amaryllis judges who selected: 'Mars' shown by Mrs. W. J. Snow to win the Greater Houston Amaryllis Club silver tray.

The Ludwig Challenge Cup was won by Mrs. P. A. Froebel for an exceptionally nice Picotee.

Mrs. A. O. Aschenbeck entered a beautiful American hybrid and was awarded a silver plate.

Seedlings entered in the show were outstanding with the best shown by Mrs. R. A. Fawcett. A silver shell was her prize.

Mrs. P. A. Froebel and Mrs. G. D. Everett tied for Sweepstakes, and each was presented a silver trophy.

Other divisions in the schedule did not have sufficient entries for competition, so no other silver trophies were given out.

Due to a very cool and wet two weeks preceeding the show date some blossoms were not show quality; however, these were brought to the garden Center and placed on a "display only" table and the visitors were glad of this as they were able to view a nice variety, some of which they will want to add to their gardens.

Our shows are principally staged to interest the public in growing amaryllis and we are happy to report that we feel our goal was accomplished due to the many questions asked the hostesses as well as the fact we were able to recruit four of those expressing the most interest. They wanted to join our club in order to learn more about growing amaryllis and we certainly hope to satisfy their wishes.

Mrs. Aschenbeck, the Club's President and Mrs. Snow, the Show Chairman were well pleased with the interest shown in the Education Exhibit and wish good blossoming to the novice hybridizers.

AMARYLLIS SOCIETY OF ALABAMA SHOW—1973

DEWEY E. HARDY, *President,*

Rt. 9, Box 55, Eight Mile, Ala., 36613

The Amaryllis Society of Alabama, Inc., held its sixth annual spring show at the Chickasaw Civic Center on Grant Street in Chickasaw, Alabama on April 21st and 22nd, 1973. The theme of the show was "Come See Our Fairyland". There was much interest shown in both the horticulture and artistic arrangements divisions. Mrs. Velma Thompson of Mt. Vernon was the show chairman this year.

Mrs. Velma Thompson of Mt. Vernon, Alabama won the AMERICAN NATIONAL BANK TROPHY for the best named Dutch Potted specimen in the show. In addition, Mrs. Thompson won the following trophies: MR. & MRS. H. P. WHEAT MEMORIAL TROPHY, Awarded to the winner of the most blue ribbons in the potted and cut seedling divisions. Divisions VII and VIII. Large silver tray with handles. CLAUDE H. MOORE MEMORIAL TROPHY, Awarded for the most outstanding horticultural specimen of potted Dutch Amaryllis in the show. Division III. Silver tray. FIRST NATIONAL BANK OF MOBILE TROPHY, Awarded to the best specimen in Division VII. Silver Paul Revere Bowl. AMERICAN NATIONAL BANK TROPHY, Awarded for the best named Dutch potted specimen in show. Silver tray. THE WILMER SMITH TROPHY, Awarded for the most outstanding potted bulb specimen in the show. Silver pitcher. FABRICS UNLIMITED AWARD, Awarded for the most outstanding cut miniature of Dutch amaryllis. Silver dish.

Mr. Dewey Hardy of Eight Mile, Alabama received the CECIL BATES TROPHY for the Educational Display.

Mrs. Claudine Pierce of Mt. Vernon, Alabama won the following trophies: MARTHA BURDETTE MEMORIAL TROPHY, Awarded for the most blue ribbons in Division V and VI. Silver tray.

Mr. C. E. Tagert of Mobile won the following trophies: PRESIDENT'S AWARD—Awarded for the most outstanding Dutch seedling hybridized and brought into bloom by exhibitor and being shown for first time Division VIII. Large silver tray with handles. DEPOSIT NATIONAL BANK TROPHY, Awarded for the most blue ribbons in the American potted Amaryllis, Division I. Silver tray. EMILE SCHEUERMANN, SR. MEMORIAL TROPHY, Awarded to the winner of the most blue ribbons in combined horticulture and artistic arrangement divisions. Silver champaigne cooler. THE AMARYLLIS SOCIETY OF ALA. INC. TROPHY, Awarded to the winner of the most blue ribbons in the cut Dutch division. Division IV. Silver tray. THE VINCENT KILBORN, SR. MEMORIAL TROPHY, Awarded for most blue ribbons in Division IV. Silver bowl. THE C. E. TAGERT, SR. TROPHY, Awarded for the most blue ribbons in the single bloom named division. Small silver bowl. THE C. E. TAGERT, SR. TROPHY, Awarded for the most blue ribbons in the single bloom un-named division. Small silver bowl. CLAUDINE PIERCE TROPHY, for most outstanding collection of three (3) scapes in Division X. Ceramic Pitcher.

Mrs. Marie Cantrell of Chickasaw, Alabama won the following trophies: CHAVIS FURNITURE COMPANY TROPHY, Awarded to the winner of the most blue ribbons in horticulture, Divisions I-VIII. Large silver tray with handles. MERCHANTS NATIONAL BANK TROPHY, Awarded for the most blue ribbons in horticulture Divisions

I—VII. Silver tray. THE T. J. SWETMAN TROPHY, Awarded for the most blue ribbons in Divisions III. Large ceramic tray.

Mrs. Mae Allen of Chickasaw, Alabama won the following trophies: AMARYLLIS SOCIETY OF ALABAMA INC. TROPHY, Awarded for the most outstanding potted miniature Dutch amaryllis. Silver dish. ALABAMA FURNITURE COMPANY TROPHY, Awarded for the most blue ribbons in the potted miniature named Dutch division. Silver dish. MITTIE YOUNG TROPHY, for corsage.

Mrs. Irene Massingill of Chickasaw, Alabama won the following trophies: SULLY'S DRIVE-IN TROPHY, Awarded to the winner of the most blue ribbons in artistic arrangement division. Silver bread tray. WEST DEPARTMENT STORE AWARD, Awarded for the most blue ribbons in artistic arrangements. Division XII. Canister set. ELLEN "JACK" CROPP TROPHY, Awarded for the most artistic design of amaryllis with elements other than fresh plant material predominating. Silver award. MT. VERNON TROPHY, Awarded for the most outstanding artistic arrangement in show. Relish dish.

In the non-member class, Mrs. Lois Koontz of Mobile, Alabama, won the AMARYLLIS SOCIETY OF ALABAMA INC., TROPHY for the most outstanding potted amaryllis, and also the AMARYLLIS SOCIETY OF ALABAMA INC., TROPHY, for the most outstanding cut amaryllis.

The horticulture judges, all from Hattiesburgh, Mississippi, were: Mrs. Charlie Bell, Mrs. E. R. Trussell, Mrs. R. A. Fowler, Mrs. F. T. Newton, Mrs. Lillie Wilson, Mrs. C. E. Woods and Mrs. Dolphis Gaucher.

Artistic arrangement judges were: Mrs. J. T. Barfield, Pensacola, Florida, Mrs. H. W. Davis, Gonzalez, Florida and Mrs. F. A. Meloy, Milton, Florida.

After the judging of the show, the judges were guests of the Amaryllis Society of Alabama, Inc., at a luncheon at a Mobile Restaurant.

1973 SOUTHERN CALIFORNIA AMARYLLIS SHOW

James M. Weinstock, *Show Chairman*
10031 Independence, Chatsworth, Calif. 91311

"Amaryllis in April," the Southern California Hemerocallis and Amaryllis Society's ninth annual show was presented April 29 and 30 at the Los Angeles State and County Arboretum in Arcadia.

The two-day run, thanks to a favorable, last-minute bit of cooperation from the weatherman, attracted 109 entries—both potted specimens and cut scapes—from 19 exhibitors. A large number of non-competitive exhibits pushed the number of flowers on display well past the 1000 mark.

Among special features were a display of species *Amaryllis*, a selection of blooming other amaryllids, educational exhibits, a show award section, and arrangements featuring amaryllis as the major flower.

A show highlight was a case honoring the Society's two Herbert Medal recipients, W. Quinn Buck and John Leonard Doran. The medals, the citations detailing circumstances and accomplishments which led to presentation of the medals flanked some general history of the medal.

When award time came, John Cage was at the head of the line. He had carefully packed nearly two-dozen blooming plants and then transported them some 400 miles from his home in Los Altos.

Mr. Cage, with his impressive entries, refuted Robert Louis Stevenson, who once said, ''To travel hopefully is a better thing than to arrive.''

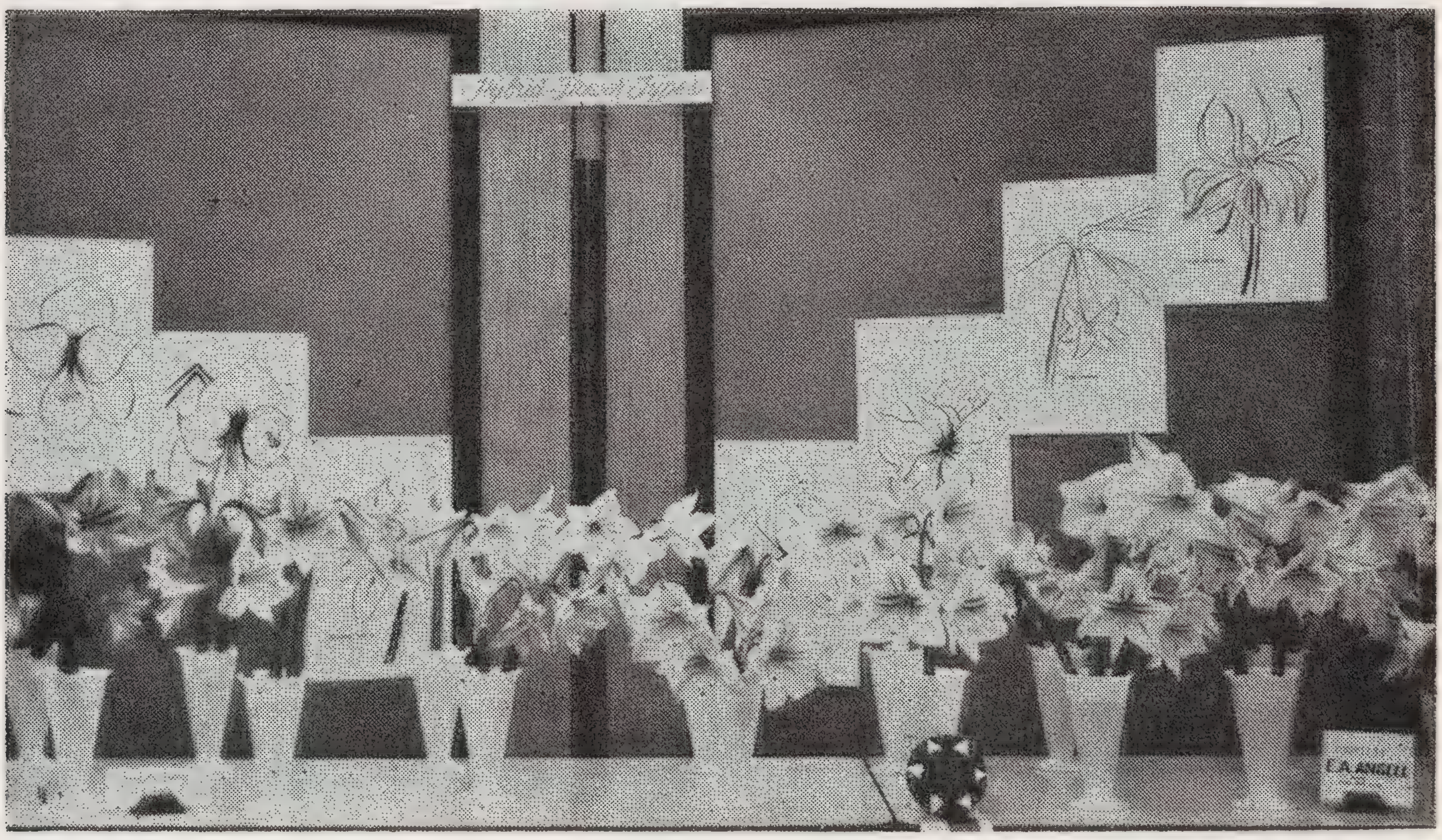

Fig. 5. 1973 Southern California Amaryllis Show. Part of educational display of Hybrid Amaryllis Flower types, in background, and award-winning display of massed Amaryllis cut flowers by Mr. E. A. Angell in **foreground.** Photo by Ken Weinstock

If well travelled, his plants were also well grown—so well, in fact, that when judges results had been tallied, Mr. Cage had walked off with the following:—The Cecil Houdyshel Memorial Trophy, a sweepstakes award for the largest number of blue ribbons won by a single exhibitor; The Southern California Hemerocallis and Amaryllis Society's award for best flower in the show for his 'Happy Memory'; the Society's award for best overall seedling in the hybridizers' division for his 'Big Tex'; the award for the best gracilis in the hybridizers' division; the popularity poll winner based on votes of show visitors, again for 'Big Tex'.

Mr. Cage also was the recipient of American Amaryllis Society Awards of Merit for Ludwig's 'It' and 'Happy Memory'.

In Awards of Preliminary Commendation from the American Amaryllis Society, Henry Myers and C. D. Cothran shared honors with Mr. Cage.

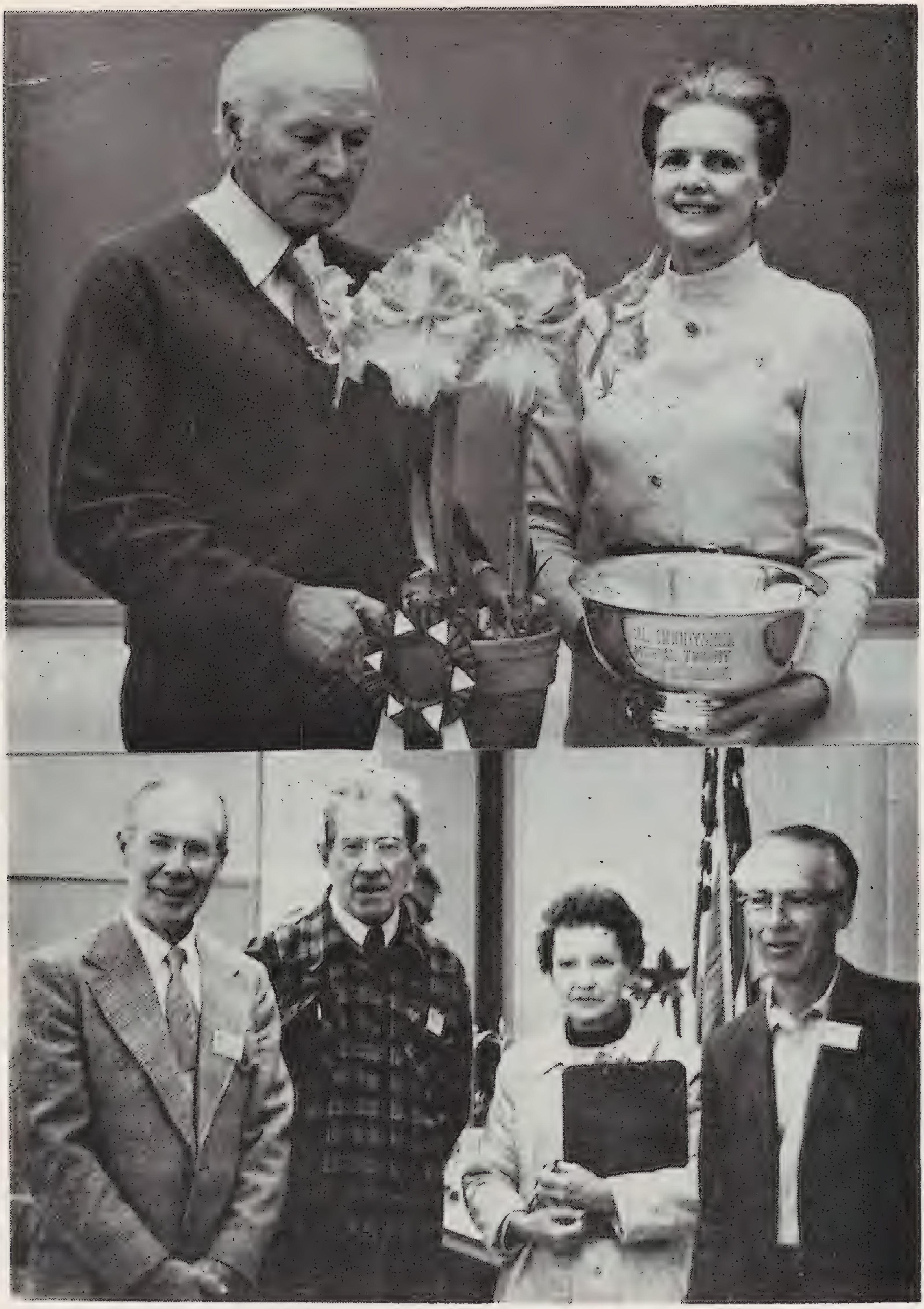

Fig. 6. Southern California 1973 Amaryllis Show. **Upper,** Dr. John Cage, show's big winner, holding top winning 'Happy Memory'; and Mrs. Mildred Cage, holding Cecil Houdyshel Memorial Trophy awarded for most blue ribbons.

Caption continued on upper page 27.

Lower, Behind a successful show are people. Among them, left to right, are Mr. C. D. Cothran, Pres., Southern Calif Hemerocallis and Amaryllis Society; Mr. Quinn Buck, HERBERT MEDALIST and judge; Mrs. Bert Williams, show standards chairman, and head judge; and Mr. J. L. Doran, HERBERT MEDALIST and hard working show committeeman. Photos by Ken Weinstock.

A final recognition for Mr. Cage came in the form of a special ribbon award from the judges.

To prevent a complete sweep by Mr. Cage, Leonard Doran garnered enough blue ribbons to stand as runner-up for sweepstakes honors. Mr. Doran also was recognized with a special judges ribbon for his many species hybrids.

Ladd Seekins and C. D. Cothran also got into the winner's circle with special judges ribbons for their well-grown specimens.

For their outstanding contributions of potted specimens and cut scapes displayed on a non-competitive basis, A. E. Angell, Bruce Claflin, and Ed Pencall were awarded rosettes.

The capable and hard-working panel of certified judges was led by Mrs. Bert Williams. Her co-workers were Mrs. Polly Anderson, Mr. Quinn Buck, and Mr. Jack McCaskill.

While many members helped make the show a successful one, the work of several deserves special note. Sterling Harshbarger prepared and submitted advance publicity for the show. For much of the unglamourous but essential, behind-the-scenes work—the many chores in setting up and closing down the show, handling hospitality, manning information desks, providing general and cultural information for show visitors, and conducting the popularity poll—the following merit commendation for service above and beyond the call of duty: Mrs. Gladys Williams, Mr. Quinn Buck, Mr. John Cage, Mrs. John Cage, Mr. C. D. Cothran, Mrs. C. D. Cothran, Mrs. Cora Doran, Mr. Leonard Doran, Mrs. Dougald MacDonald, Mr. Phil Rosoff, and Mrs. Phil Rosoff.

AMARYLLIDS AND THE FLOWER ARRANGER

MARGARET MACDONALD, *501 W. Coolidge Drive,*
San Gabriel, California 91775

Which blossoms won the top awards at the Southern California Amaryllis Show in April of 1973? Those that were ten to twelve inches across. That's enough to frighten this flower arranger right out of the Society!

For some reason, men (and most of the flower judges are men) have equated ''biggest'' with ''best''. If they don't get over this mania (or should I say ''man''-ia) soon, there won't be any amaryllids left that flower arrangers can use.

I have watched this emphasis on ''bigness'' affect the Orchid and Camellia Societies, as well. Cattleya orchids have become so large and vulgar that no respectable woman would be caught wearing a corsage of them. Camellia growers have now resorted to using hypodermic needles to inject gibberellic acid into their flowers to force them into monstrous proportions. (The drug-age has come to the flower kingdom!) Again, these unnaturally large blooms are awarded top honors.

In April of 1973 I was asked to make some arrangements for the Southern California Amaryllis Show. I could choose any cut blooms among the hundreds there, for my use. It was difficult to find any small enough in scale to fit the largest containers I had brought.

When the hybridizer of amaryllis works for larger flowers, he may not realize that to be in proper scale, a ten inch flower would normally have a three to four foot scape. Such a cut flower would require a container of such heroic proportions that it would only be suitable in a castle or a civic auditorium.

Now Mother Nature rarely plans her flowers in this dimension. (I don't know what ''Father'' Nature would have done. I'm only glad he didn't get on the planning committee!) When Mother Nature grows a monstrous flower, such as a giant sunflower, she has the good sense to put it on a twelve foot stalk.

Fortunately, daylilies still delights the flower arranger. The wiry stems of daylilies make them more graceful and usuable in flower arrangements than do amaryllis. But daylily hybridizers seem to be working for larger flowers, too. The day will come soon when the grower comes up with a twelve inch daylily. At that point, I won't ''arrange'' them. I will EAT them—as the Orientals do now.

Back to the Amaryllis. When scapes are cut for arrangements, I have found that the base of the stem splits after being immersed in water or impaled on a pin-type frog. I have overcome this tendency by wrapping the bottom inch or two with dull surfaced Scotch tape. (This won't show even in a glass container.) I also use a florist type compound, such as ''Stay Bloom'' to prolong the freshness and vigor of both scape and bloom.

In the years to come, the flower arranger is going to have to turn more and more to the species Amaryllis in order to have a good scale and proportion in an arrangement. I think even the hybridizer is going to realize that small flowers can be just as beautiful as large ones, and more useful when cut and brought into his home. Perhaps then he will turn his attention and talents to growing more of them. (I will rejoice on that day!)

Please don't misunderstand me. I appreciate the hard working hobbyist, grower, judge and hybridizer. I just think we have enough Amaryllis Gigantea crossed with Amaryllis ''Super-Duper Collossal''.

AMARYLLIS JUDGE'S CERTIFICATES

Since the last report in the 1973 AMARYLLIS YEAR BOOK (p. vi), the following numbered Amaryllis Judge's Certificates have been issued.

AMARYLLIS JUDGE'S CERTIFICATES—Continued page vi.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE VI.*

Pierfelice Ravenna

Universidad de Chile

The present series of studies deal with several genera from Argentina, Bolivia, Brazil, Chile, Peru, and Uruguay. The characters and relationships of the genus *Traubia* are elucidated. A new tribe Griffiniae, is proposed to accommodate the genus *Griffinia.* The genus *Castellanoa* is reduced to the synonymy of *Chlidanthus.* A new subgenus, *Fulgituba,* within *Stenomesson,* is erected for the group of species allied to *S. incarnatum.* *Clitanthes* Herb., hitherto considered as a synonym of *Stenomesson,* is validated as an additional subgenus of the latter. Moreover, descriptions of new species in the genera *Amaryllis, Griffinia, Habranthus, Stenomesson,* and *Zephyranthes,* as well as several miscellaneous notes, are included.

I wish to express my gratitude to Dr. Vincent Santilli, Faculty of Sciences, University of Chile, for correcting the English manuscript, and to the following institutions, or owners of private herbaria, for their cooperation: B, BA, BAB, BHMG, E, K, LIL, NY, P, PACA, R, RB, SGO, SI, U, UP, Herb. Hatschbach (Curitiba, Brazil), Herb. Ruiz Leal (Mendoza, Argentina), Herb. Zoellner (Quilpué, Chile).

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IX. Genus **Castellanoa** reduced to synonymy of **Chlidanthus**
X. Studies in the Genus **Stenomesson**

I. THE GENUS **TRAUBIA**

Although imperfectly described by Moldenke (1963), the genus *Traubia* proved to be a distinct entity. Therefore, in order to clear up some misinterpretations of characters, an emended description is given here. *Rhodophiala modesta* Phil. is transferred to this genus.

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* Series V of this work was publ. in Notic. Mens. Mus. Nac. Hist. Nat. Chile, 189, Sept. 1972.

TRAUBIA Moldenke, emend

Moldenke, Pl. Life 19:55. 1963.

Flowers slightly zygomorphic, pedicellate, cernuous or ascending. Ovary almost quadrate, obtusely trigonous, subtricoccous, with minute purplish lines. Tepals linear-oblong, spreading horizontally, shortly connate at the base, white or whitish, with two narrow purple veins on the adaxial face, and a dark purple (wine-red) streak on the abaxial face, very rarely completely white. Filaments fasciculate, ascending, 4-seriate, but differences in length not easily perceptible, very slightly or not incurved at the apex; upper episepal the shorter, lower epipetal the longer, episepal and epipetal pairs intermediate. Anthers oblong-elliptical before dehiscence or sometimes ovate, dorsifixed, becoming recurved or imperfecty versatile after dehiscense. Pollen fusiform, unisulcate. Style almost always declined below the stamen fascicle, but not lying on the lower inner tepal, filiform. Stigma capitate. Capsule depressed, markedly tricoccous, a brownish-gray marked with minute dark brown or reddish-brown lines or points. Seeds semiovate of semielliptic, black, shiny, with membranous edges.

Dwarf bulbous plants. Bulb ovoid, small, covered with brown, membranous coats, produced into a pseudo-neck. Leaves linear, narrow, ascending, somewhat fleshy, green, moderately channelled or sometimes flat, obtuse or subacute. Scape quite narrow (about 0.9-1.3 mm), very strictly fistulose or sometimes apparently subsolid, marked with minute reddish-brown lines. Inflorescence umbellate, 1-5-flowered. Spathe bivalved; valves narrowly lanceolate, marcescent, free to the base or very rarely connated by one of their margins and splitting on one side.

Type-species: *Traubia chilensis* (F. Phil.) Mold. (*Lapiedra chilensis* F. Philippi) = *Traubia modesta* (R.A. Phil.) Rav.

A single species from the provinces of Coquimbo and Aconcagua, Chile.

According to F. Philippi (1896), the illustration which accompanies the orginal description of *Lapiedra chilensis*, was made from the type—specimen. The figure shows details of two anthers; one of these appears as basifixed and hastate. This feature is mentioned in the description: ''antheris basi sagittati dimidium filamenti aequantibus luteis''.

Having had some experience in examining fresh and dried material of the species, I am convinced that the *sagittate character* of the anthers was probably a consequence of the process of boiling and dissecting. In fact, tissue which connects both anther lobes, below the insertion of the filament, is rather fragile and breakable in dissection. In the living and pressed plants from the type-locality and other places, that I have studied, anthers were decidely not sagittate. Although not versatile before dehiscence, anthers show a clear tendency to become so after pollen shedding. Sometimes they are recurved only in the upper half, but often can be defined as versatile. The former condition is due, in part, to the fact that the filaments are very slightly or not incurved at the apex. In *Rhodophiala* and *Placea* they are incurved. In the latter genus anthers are often similar in shape to those of *Traubia*. *Rhodophiala* has linear-oblong anthers which are versatile even in the bud.

Since the flowering stem was described as ''solid'', it is necessary to review this point. The scape is so slender that the hollow portion is almost imperceptible. However, the latter can be seen under a microscope. Therefore, the scape must be defined as *hollow*.

Rhodophiala modesta R.A. Phil. (1873), is the same species as *Lapiedra chilensis* F. Phil. (1896). This had been discovered earlier by F. Johow and published postumally in his ''Flora de las plantas vasculares de Zapallar'' (see Johow 1948, pp. 63-64). At that time, however, a suitable generic name for this species had not been published. A new combination in *Traubia* is proposed here.

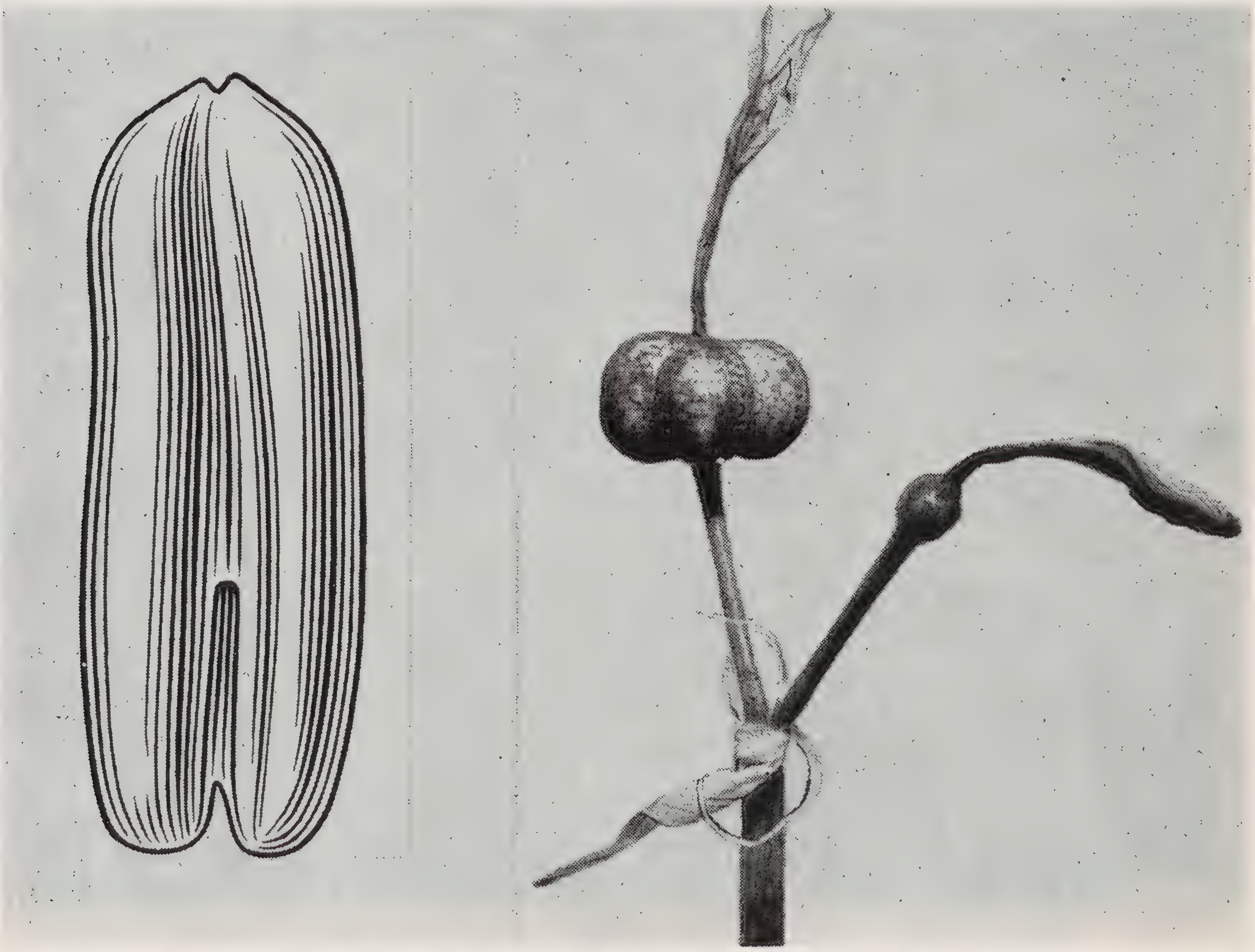

Fig. 7. **Traubia modesta** (R. A. Phil,) Ravenna. **Left,** back view of an anther before dehiscence; (x38.9), note insertion area of filament in lower third. Drawing by Pierfelice Ravenna.

Right, capsule. Approx X 1.3. Photos by Pierfelice Ravenna.

Traubia modesta (R.A. Phil.) Rav., **comb. nov.**
(Figs. 7 and 8)

Rhodophiala modesta R. A. Philippi, Anal. Univ. Chile 43: 544. 1873; Pl. Life 12: 73-74. 1961.—*Hippeastrum modestum* (Phil.) Baker, Journ. Bot. 16:83. 1878.—*Lapiedra chilensis* F. Philippi, Anal. Univ. Chile 93: 144. 1896.—*Amaryllis modesta* (Phil.) Traub et Uphof, Herbertia 5: 123. 1938.—*Traubia chilensis* (Phil.) Moldenke Plant Life 19 :55. 1963.

Plant 4-6 cm high. *Bulb ovoid,* covered by dark brown coats, about 15-18 mm long, 8-12 mm wide, prolonged for 18-30 mm into a pseudoneck. *Leaves* vernal, absent at anthesis, spreading upwards, linear, bright green, rather fleshy, moderately channelled to almost flat, with an obtuse or subacute apex, to 8-12 cm long, 1.9-2.9 mm broad. *Scape* cylindrical, yellowish brown flushed by diminutive purple-brown lines, to 23-50 mm long, 0.9-1.2 mm broad. *Spathe* membranous, bivalved or rarely 1-valved and splitting on one side, dull whitish, often purple streaked; valves free to the base, narrowly lanceolate, 12-15 mm long; inner bracts almost filiform, about the length of the pedicels or slightly longer. *Inflorescence* 1-5-flowered. *Pedicels* stiff, spreading upright, about 7-10 mm long, of the same color as the scape. *Flowers* star-shaped, white,

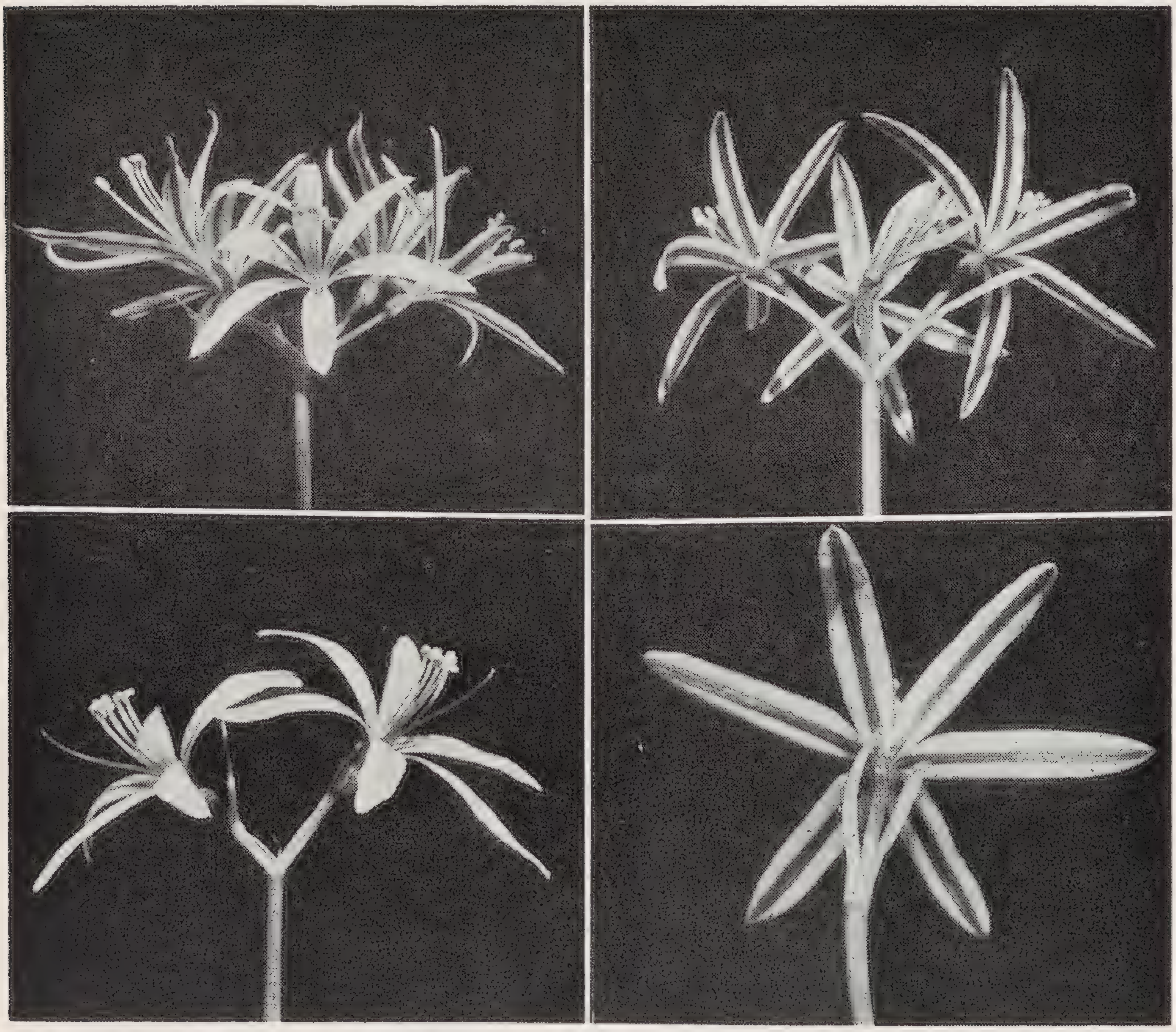

Fig. 8. **Traubia modesta** (R. A. Phil.) Ravenna, umbellate inflorescence: **Upper left**, 5-flowered umbel; **Upper right**, 4-flowered umbel, back side; **Lower left**, 2-flowered umbel; and 1-flowered umbel, back side. See text for exact flower size. Photos by Pierfelice Ravenna.

often palely purple-tinged at the center, about 29-40 mm in diameter. *Ovary* almost squarely triquetrous to almost tricoccous, the same color as the pedicels, about 1.9-2.3 mm long, 1.9-2.3 mm in diameter. *Tepals* oblong or linear-oblong, whitish with two, pale, purple streaks near the base, and a larger, dark purple streak, from base to top, on the abaxial face, connate below for 1.9-2.2 mm, about 15-20 mm long; the outer 3-4 mm broad, with a 0.25-0.3 mm long purple apicule; the inner 2.8-3.9 mm broad, acute. *Filaments* often closely fascicled, erecto-patent, whitish, flushed with purple-pink in the lower half; the upper episepal 7-7.5 mm long, lateral episepal 7.2-8 mm long, lateral epipetal 7.8-10 mm long, lower epipetal 8-11 mm long. *Anthers* oval-oblong before dehiscence, attached to the filament in the lower third or half, at the upper end of a channel, about 2.5-3.2 mm long, 0.95 mm broad, ending at the base in two lobes ca. 0.2-0.5 mm long; almost reniform after dehiscence, 1.7-1.9 mm long. *Pollen* fusiform, one-furrowed, yellow. *Style* purple-pink, flesh-pink or whitish-pink, to 13-14 mm long. *Stigma* minutely capitate. *Capsule* markedly tricoccous, grayish-brown or yellowish-brown flushed by diminutive brown points and streaks, about 7.8-8.8 mm in diam. *Seeds* semioval or semielliptic, black, shiny, with membranous edges, about 4.3-4.5 mm long, 2.4-2.5 mm broad.

Habitat.—Hills and plains in the South of the province of Coquimbo and north of Aconcagua; it is often found not far from the sea. At Pichidangui, it grows near *Leucocoryne violascens, Sisyrinchium graminifolium* ssp., *Conanthera campanulata, Tecophilea violaeflora, Oxalis* sp., and other herbs; near Salamanca, it grows near *Placea ornata, Miersia myoides,* and others.

Specimens: Chile, province of Aconcagua, Cuesta de Los Molles; leg. F. Philippi (SGO 47179, type of **Rhodophiala modesta** R. A. Phil.). Idem ibidem; leg. ipse (SGO 47179, isotype of **Rhodophiala modesta**). Idem, Yerbas Buenas; leg. F. Philippi?, III-1894 (SGO 37999). Sine data; leg. F. Albert, II-1890 (SGO 47188 & 38035). Province of Coquimbo, in praedio Chuchiñí pr. Illapel; leg. Geisse, II (SGO 46914, type of **Lapiedra** chilensis F. Phil.). Idem Salamanca, Cuesta Chalinga; leg. Geisse, I-1895 (SGO 72932). Idem, Pichidangui; leg. Ravenna 1780, IV-1970 (Herb. Rav., SGO). Idem in praedio Vallecite prope Población Halcones; leg. Ravenna 2020, V-1972 (Herb. Rav., SGO).

II. STUDIES IN THE GENUS **PYROLIRION**

1. An important character for the separation of **Pyrolirion** from **Zephyranthes**

The genus *Pyrolirion* was erected by Herbert (1821), in order to accommodate *Amaryllis aurea* Ruiz et Pav., *A. flammea* R. et P., and a third species which he named *P. flavum.* Herbert separates this genus from *Zephyranthes,* on account of the ''filaments erect, nearly equal''. Baker (1888) reduced this group to a subgenus of *Zephyranthes,* adding *Zephyranthes boliviensis* Bak. Sealy (1837) restored *Pyrolirion* to generic rank, incorporating a new feature: the apparent existence of ''two opposite segments quite free from one another'' in the upper part of the spathes. According to this author, this character, along with the almost tubular perigone below, and the sub-equal stamens, is a useful character which distinguish *Pyrolirion.* Notwithstanding this, Sealy refers to this genus *Z. boliviensis* Bak. (and its synonyms), a species which does not have any of the three stated features. In the latter species, the spathe is monophyllous, the perigone clearly infundibulate, and the stamens are quite dissimilar in length (see Ravenna 1971, p. 68, under *Zephyranthes boliviensis*).

Recently, I had the opportunity to examine, in North Chile (inedit datum), fresh flowers of *Pyrolirion tubiflorum.* Years ago, I also collected it near Mala, in the Lima dept., Peru. In this species the stigmatic area is placed at the emarginate apex of true style divisions. This distinctive mark, although not properly evaluated, had been previously observed by Lindley (1834); when distinguishing *Pyrolirion* from *Zephyranthes,* he says: ''it differs, however, from that genus in its sessile flowers, which we incline to consider a character of much importance, and in the dilation of the points of its stigma into little spoons''. A careful examination shows that this kind of style branches are conduplicate and flattened.

In *Zephyranthes,* the stigmatic area occupies the whole adaxial part of three, not flattened divisions. Thus, they are defined as parts of a trifid (or capitate-trilobed) stigma.

In Traub's ''The genera of the Amaryllidaceae'' (1963), *Pyrolirion* is described as having a ''stigma deeply trifid or capitate''. This author states that ''ten species are tentatively recognized . . . ''. In my opinion, the mention of a capitate stigma, and of such a number of species are conditions not to be assigned to *Pyrolirion.* Both statements were probably written on account of Sealy's suggestions (1937, p. 208) that *Z. bricketii* Macbr., *Z. parvula* Kill., *Z. pseudocolchicum* Kraenzl., and *Z. beustii* Schinz., should be referable to this genus. *Pyrolirion flammeum* and *P. flavum* are probably identical to *P. tubiflorum.* The spathe of the latter species can be either bifid or entire. *Pyrolirion* seems to have, in my opinion, not more than two species.

2. The leaves of **Pyrolirion boliviense**

In March, 1970, I was for the second time in the valley of Sorata, Bolivia. I was able to collect again several bulbous plants, that I found in 1960, such as *Amaryllis scopulorum* and *Pyrolirion boliviense.* I was unable to locate the latter again in the upper river Challasuyo, but found a few bulbs near the top of the Cerro del Iminapi, and also near Incachaca, on the plateau.

Cárdenas (1971) publishes a description of the species (as *P. xiphopetalum*) and a photograph of a few plants cultivated in pots. Nevertheless, this author says nothing about leaves. Traub (1972, page 66) amplifies the description by giving the measures of them, after a communication from Dr. Cárdenas. Notwithstanding, it seems necessary to give a complete description of the leaves of this species.

Descr.—Leaves hyteranthous, about two or three each year, linear, fleshy but not flaccid, moderately channelled, nervose, to 8-15 cm (rarely more) long, 2-3 mm broad, ash-green, slightly pruinose.

Specimens: Bolivia, prov. Larecaja, near Sorata, Cerro del Iminapi, about 2800 m; leg. Ravenna 1350, III-1971 (Herb. Rav.), sterile.

III. STUDIES IN THE GENUS **ZEPHYRANTHES**

1. New species from Brazil and Bolivia,

Zephyranthes capivarina sp. nov. (Fig. 9)

Species floribus utrinque luteis instructa. *A. Zephyranthes flavissima* qui etiam Paranaensi et *Z. citrina* foliis saepe subplanis circ. 3-8 mm latis stigmate trifido cum lobis linearibus differt.

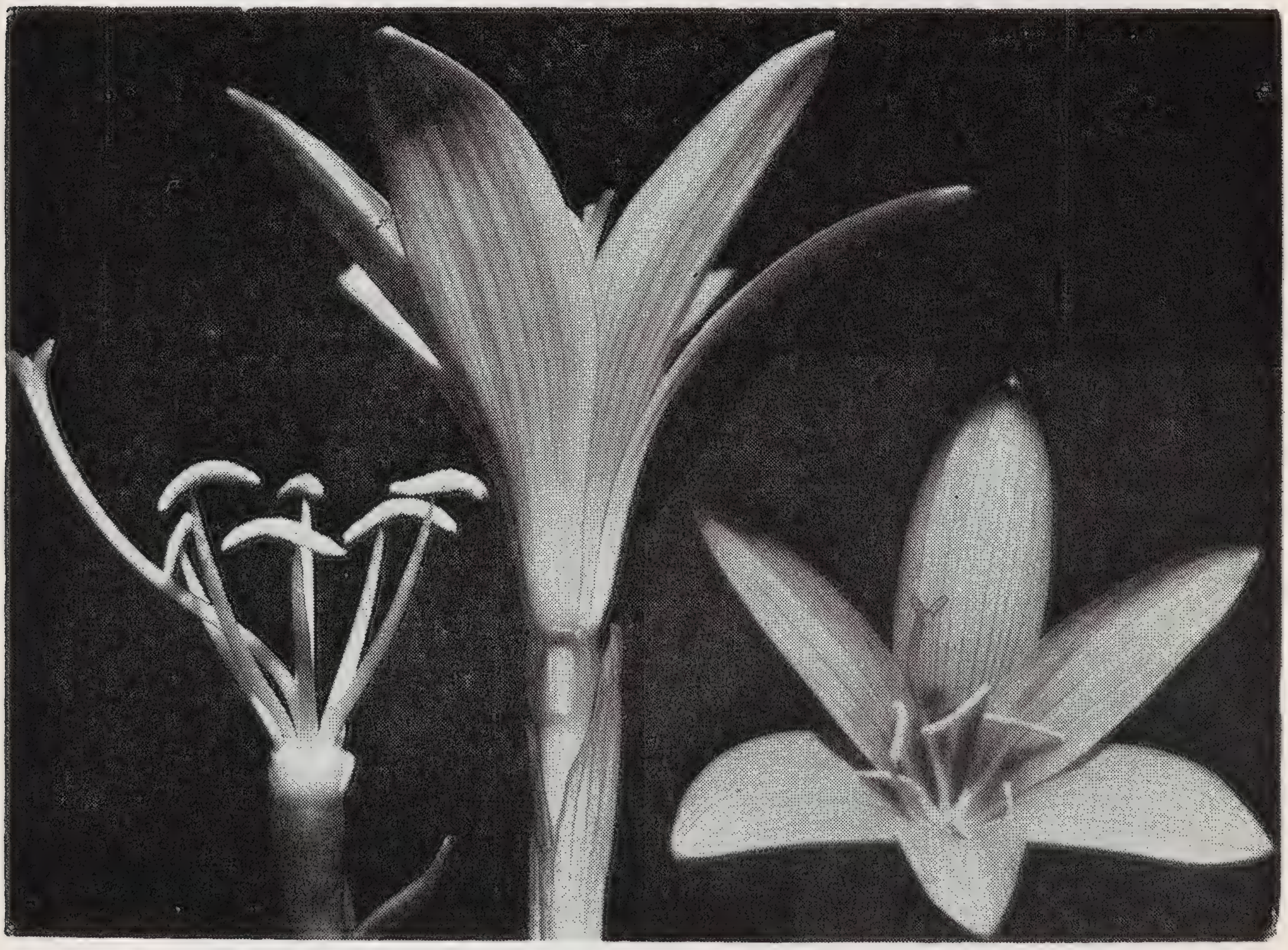

Fig. 9. **Zephyranthes capivarina** Ravenna, **Center**, side view of flower. **Right,** upper view of flower. **Left**, androecium (stamens) and gynoecium (pistil). Photos by Pierfelice Ravenna.

Plant about 20 cm high. *Bulb* almost globose, 20-26 mm in diameter, covered by dark brown coats; *pseudo-neck* 30-45 mm long. *Leaves* 2-4, present at anthesis, linear, almost flat, a bright green, to 8-15 cm long, 3-8 mm broad, almost obtuse. *Scape* 10-15 cm long, a pale green in the upper half, reddish below, not pruinose. *Spathe* one flowered, membranous, slightly compresses, often reddish, with a fenestrate apex, or bifid for 7 mm. *Pedicel* ca 27 mm long, 2.8 mm broad, a pale green. *Ovary* obovate or shortly elliptic, a dark green, 4-5.2 mm long, 3.8-4.3 mm broad. *Perigone* widely funnel-shaped, bright yellow, about 30-34 mm long, 45-55 mm in diameter. *Tepals* oblanceolate, joined at the base for 2.4 mm 36-39 mm long; the outer about 10.5 mm broad, with a diminutive thickened apicule; the inner ca. 10 mm broad, almost obtuse. *Filaments* spreading upwards, yellow, somewhat paler; episepal 10-11 mm long, epipetal 13-14 mm long. *Anthers* linear-oblong, often somewhat flexuose, 4-5 mm long after dehiscence. Style curved, ascending, yellow, 21-23 mm long. *Stigma* trifid, its divisions spreading, 2.2-4 mm long. *Capsule* depressed globose, marketedly tricoccous, a bright, sometimes reddish, green, about 14-16 mm in diameter. *Seeds* oval or semicircular, ca. 5-6 mm long.

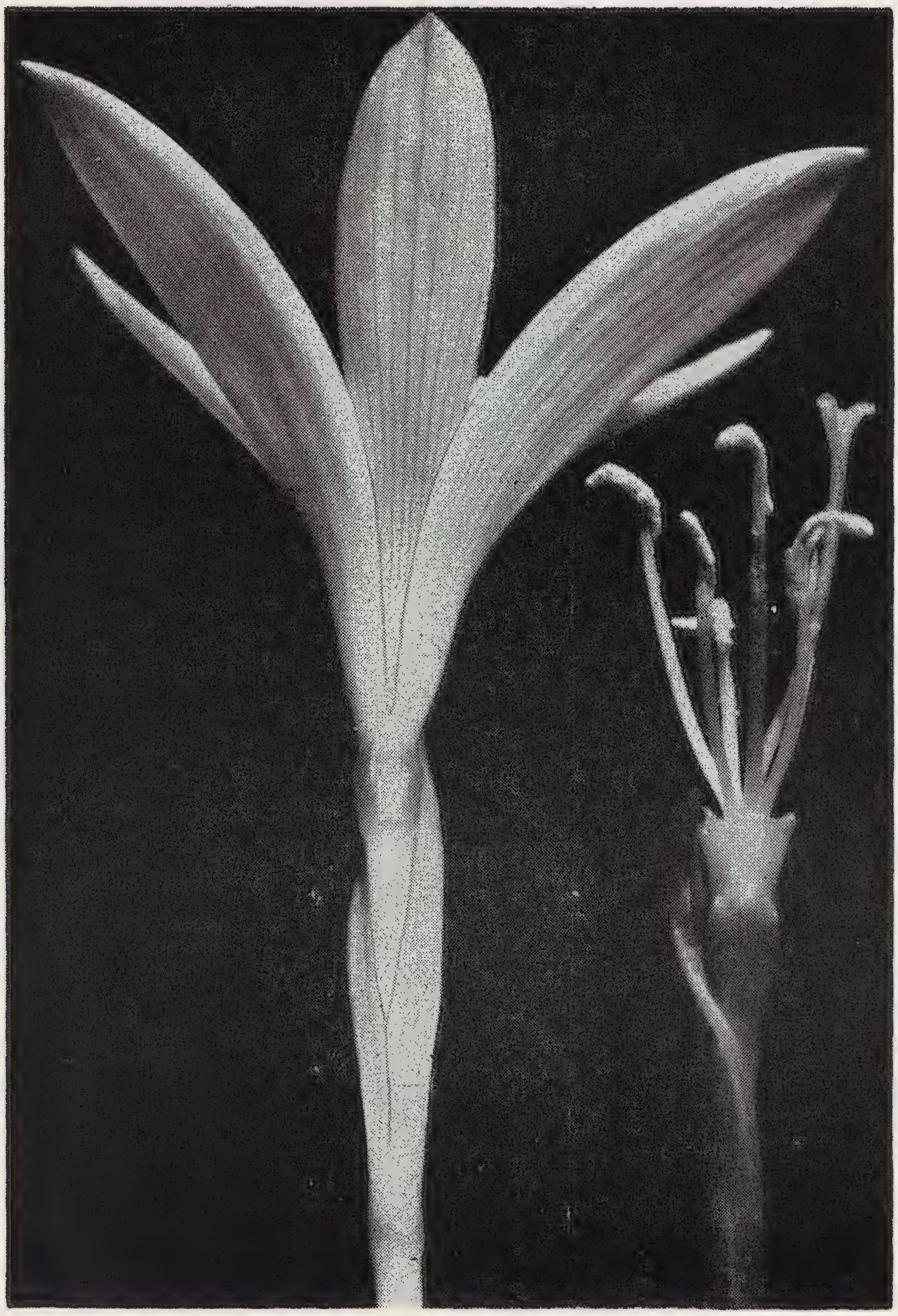

Fig. 10. **Zephyranthes paranaensis** Ravenna. **Left,** side view of flower from back. **Right,** Androecium (stamens) and gynoecium (pistil). Photos by Pierfelice Ravenna.

Hab.—Among rocks on the banks of the rivers Capivarí and Jangada, in the State of Paraná, Brazil. In the former river, it was found in a very small spot, closely associated with *Nothoscordum capivarinum* sp. nov. (inedit), whose leaves are undistinguishable from those of this species. Plants were growing in a frankly sandy soil. The circundant vegetation, out of the rocks, is the much modified rain forest.

Specimens: Sesmarías ad ripas fluminis Capivarí mun. Bocaiuva do Sul civitatis Paraná Brasiliae; leg. Ravenna 1010 et G. Hatschbach, XI-1969 (typus in Herbario Ravennae). Mun. Bocaiuva do Sul. Río Capivarí, Sesmarias; leg. G. Hatschbach 20232, 11-XI-1968. Mun. Gral. Carneiro, Río Jangada; leg. G. Hatschbach 22723, 27-X-1969 (Herb. Hatschbach, Herb. Rav.).

This pretty species is remarkable for its broad almost flat leaves. Due to its trifid stigma, it is placed in subgenus *Zephyranthes,* along with the next species here described.

Zephyranthes capivarina lives in a very restricted habitat, among exposed rocks on the banks of the above mentioned rivers. These outcrops are not frequent, since the woody vegetation often reaches the banks. Hence, the species is very rare and difficult to find.

The species deserves cultivation. The bulbs are hardy when planted in full sun using river sand. Under these conditions, plants will flower and reproduce easily. Seeds have been sent to Kew Gardens and to Florida (U.S.A.).

Zephyranthes paranaensis sp. nov. (Fig 10)

A *Zephyranthe capivarina* valde affinis sed habitu graciliore foliis angustissimis canaliculatis et flore minore recedit.

Planta usque 8-13 em alta. Bulbus globosus circ. 15-20 mm latus. Folia ad anthesin praesentia vel incipientia anguste linearia canaliculata fusco-viridia circ. 0.95-2.2 mm lata. Scapus 6-10.5 cm longus. Perigonium luteus ad 16-24 mm longum circ. 26-30 mm latum. Filamenta lutea, sepalina ad 10 mm longa, petalina circ. 13 mm longa. Antherae lunulate leviter flexuosae post dehiscentiam usque 4.6 mm longae. Stylus to 18 mm longus. Stigma trifidus lobis erecto-patentibus circ. 2 mm longis. Capsula circ. 11.3 mm lata. Semina usque 3 mm longa valde complanata.

Plant 8-13 cm high. *Bulb* globose, 15-20 mm in diam., covered with dark brown coats and produced into a 15-30 mm long *pseudo-neck. Leaves* present or incipient at anthesis, often about 7 or less, narrowly linear, channelled but not carinate, a bright green, to 12-45.4 cm long, 0.95-2.2 mm broad. *Scape* cylindrical, 6-10.5 cm long, a pale green. *Spathe* rufescent, about 25 mm long, tubulose for 14 mm, with a fenestrate apex. *Pedicel* ca. 16-19 mm long, 1.9 mm broad. *Perigone* yellow, 16-24 mm long, 26-30 mm in diam. *Tepals* oblanceolate, ca. 20 mm long; the outer 5-7 mm broad, shortly apiculate, the inner acute, 3.7-5 mm broad. Filaments upright, slightly curved, yellow; episepal to 10 mm long; epipetal 13 mm long; basal ring diminutive, fimbriate-lacerate. *Anthers* narrowly semilunate after dehiscence, slightly flexuose, yellow, about 4.6 mm long. Style curved, ascending, yellow, to 18 mm long. *Stigma* trifid, its divisions spreading upright, slightly curved, about 2 mm long. *Capsule* globose-subtrigonous, tricoccous, ca. 11.3 mm in diameter. *Seeds* small, black, about 3 mm long, much flattened.

Hab.—In stony, apparently basaltic, fields, of the second plateau of the State of Paraná, in Brazil. It has been found at Canta Galo, municipe of Guarapuava, and near Leroville, mun. Londrina. It grows, in the former location, near *Nothoscordum exile* sp. nov., *Sisyrinchium* sp., and other herbs.

Specimens: In campis glareosis ad Canta Galo mun. Guarapuavae civit. Paraná Brasiliae; leg. Ravenna 1015 et G. Hatschbach, 4-XII-1969 (typus in Herbario Ravennae). Mun. Guarapuava, Canta Galo; leg. G. Hatschbach 19865, 26-IX-1968 (Herb. Hatschbach, Herb. Rav.). Mun. Londrinia, Leroville, Campo das Pedras; leg. Hatschbach 22897, 17-XI-1969 (Herb. Hatschbach, Herb. Rav.).

This interesting species is related to *Z. capivarina*, and it also belongs in the subgenus *Zephyranthes*. It is readily distinguished by the slenderness of all its parts.

Zephyranthes paranaensis grows easily when cultivated in pots with neutral sandy soil. It should be a worthy object for rock gardens. Bulbs produce offsets in a short time.

Zephyranthes rosalensis Rav. sp. nov.

Species a *Zephyranthe mesochloa* proxima sed folis ad anthesin absentes flore majore apicem versus roseo inferne pallidiore vel alboroseo. Planta 21.5-30 cm alta. Scapus 14-19.5 cm longus circ. 3mm crassus. Ovarium obovatum. Perigonium infundibulatum sursum roseum deorsum pallidiore vel albus roseo suffusum ad 40-42 mm longus. Tepala oblanceolata. Filamenta arquata erecto-patentia, sepalina 8-10 mm longa, petalina 13-16 mm longa. Antherae lunulatae ad 3.5-6 mm longae. Stylus 19-21 mm longus; stigma trifidus lobis 2.5-4 mm longis instructus.

Plant 21.5-32 cm high. *Bulb* and *leaves* not seen. *Scape* apparently cylindrical, to 14-19.5 cm long, 3 mm broad. *Spathe* one-flowered, membranous, pale, tubular for 15-20 mm, bifid ca. 12-15 mm. *Pedicel* 25-75 mm long. *Ovary* obovate. *Perigone* erect, funnel-shaped, pink in the upper half, paler below, or white pink tinged, about 40-42 mm long. *Tepals* oblanceolate, joined at the base for 2.5-3 mm; the outer 35-42 mm long, 7.5-10 mm broad, bearing a 0.4-0.8 mm long apicule; inner 35-38 mm long, 6-7 mm broad. *Filaments* curved, ascending; episepal 8-10 mm long, epipetal 13-16 mm long. *Anthers* semilunate, ca. 3.5-6 mm long. *Style* 19-21 mm long. *Stigma* trifid, its divisions recurvedly spreading, 2.5-4 mm long.

Hab.—It grows wedged between rocks, on sunny, rocky slopes near Rosal, in the dept. of Chuquisaca, Bolivia.

Specimens: Bolivia, Chukuisaca, Rosal; leg. Miss W. M. A. Brooke 5428, 30-IX-1949 (type U).

Allied to *Z. mesochloa,* but differing from it in the serotine leaves, and in the larger, mostly pink or pink-tinged flowers. The above is the only place where the plant was found.

Zephyranthes challensis Rav. sp. nov. (Fig. 11)

Species a *Zephyranthe andina* proxima sed bulbis valde minoribus foliis gracilioribus fusco-veridis haud glaucescentibus floribus pallidioribus subalbis.

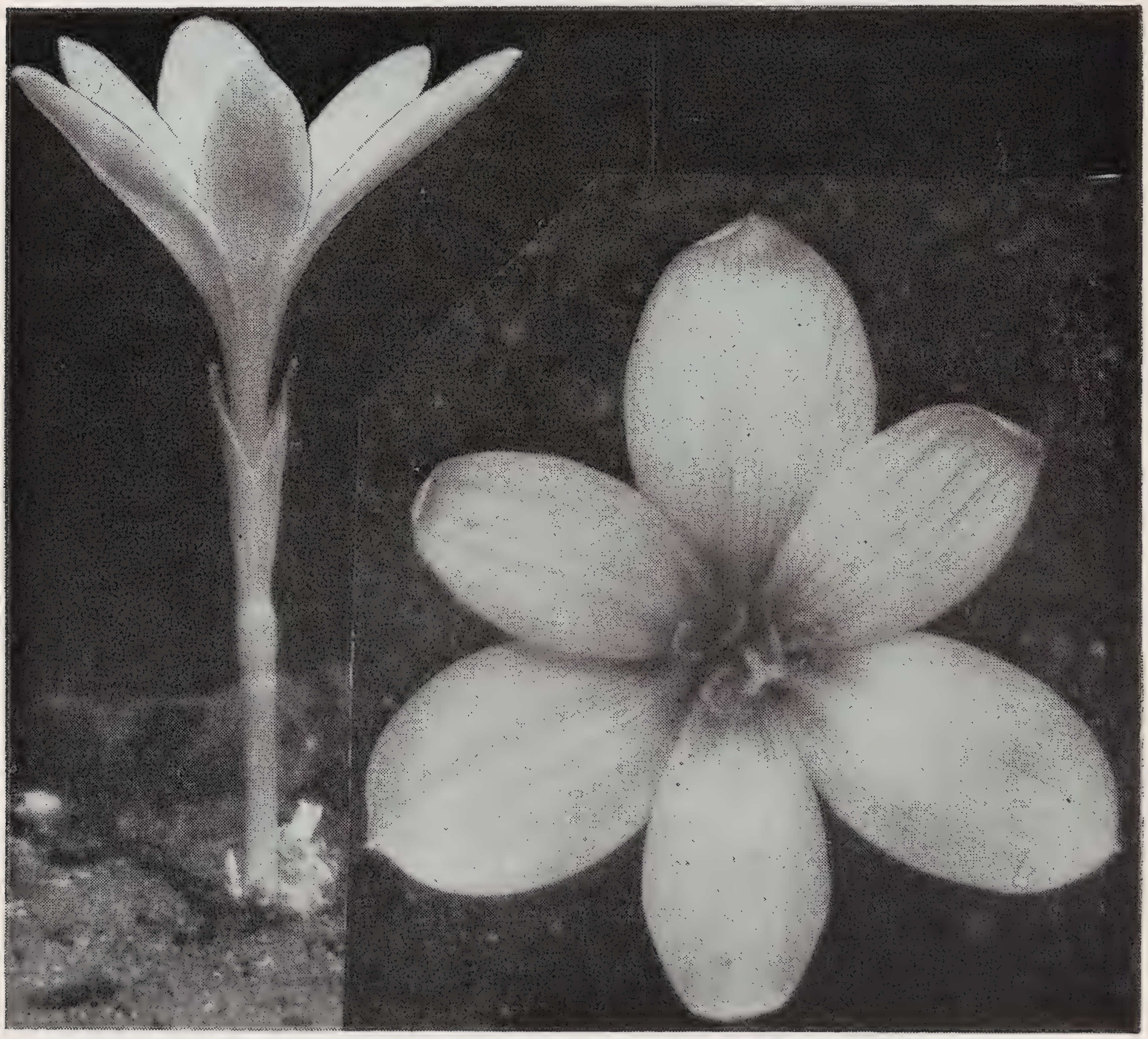

Fig. 11. **Zephyranthes challensis** Ravenna. **Left,** side view of plant in flower with partially developed flower stem. **Right,** Upper view of flower, as cultivated at Santiago, Chile. Photos by Pierfelice Ravenna.

Plant 40-62 mm high when in flower. *Bulb* ovoid, 24-26 mm long, 17-20 mm wide, covered by brown tunics and prolonged into a 15-40 mm long pseudo-neck. *Leaves* in summer and autumn, linear, somewhat fleshy, slightly channelled, dark green, about 10-20 mm long, 2-2.5 mm broad. *Scape* 0-11 mm above the soil, slightly compressed, pale green, 2.7-2.8 mm broad. *Spathe* membranous, whitish, often partially buried, about 22 mm long, tubular for 14 mm, then bifid and dirty greenish.

Inflorescence one-flowered. *Pedicel* obsolete, 1.5 mm long. *Ovary* oblong-subcylindrical, 3.3-5 mm long, 2.6-2.8 mm wide. *Perigone* internally white, excepting the yellowish-greenish throat, to 37-45 mm long, 30-42 mm in diameter. *Perigone-tube* 16-30 mm long. Tepals oblanceolate, spreading, externally a very pale pink or lilac-pink, internally white or whitish; the outer 22-29 mm long, 9-12.8 mm broad, with a diminutive and pennicillate apicule; the inner 19-27 mm long, 6.5-10.5 mm broad, obtuse or subacute. *Filaments* filiform, whitish, attached to the base of tepals; the episepal 8.8 mm long, the epipetal 6.8 mm long. *Anthers* falcate, 3-3.5 mm long; pollen yellow. *Style* filiform, slightly curved, whitish, about 26-34 mm long. *Stigma* lobes spreading, 1.3-1.4 mm long.

Habitat.—Dry slopes about 200 m north from Challa, dept. of Cochabamba, Bolivia, about 3500 m of altitude.

Specimens: Culta in Santiago Chiliae ex bulbis in decliviis pr. Challa civit. Cochabamba Boliviae collectis; leg. Ravenna 2022, IX-1972 (typus in Herb. Ravennae, isotype TRA).

Zephyranthes challensis is closly related with *Z. andina,* within subgenus *Haylockia,* differing in the smaller bulbs, slender, dark-green leaves, and the paler flower color. Plants of the latter species were received from Mr. J. Fernández, of Mina Aguilar, province of Jujuy, Argentina; the bulbs were about 4-5 cm long, 28-33 mm wide, and the leaves glaucescent and broader that those of *Z. challensis.*

The first plant of *Zephyranthes challensis,* that flowered with me, bore a 11 mm long scape; in the second plant flowered, the scape was completely included in the pseudo-neck.

2. **Zephyranthes bakeriana** and other binomials reduced to synonymy of **Zephyranthes mesochloa** (Fig. 12)

The report of *Zephyranthes bakeriana* Morong in the floras of Argentina and Brazil, respectively, in two different articles signed by A. T. Hunziker (1969 & 1971), makes necessary a critical treatment.

Zephyranthes bakeriana Morong (1893) had been based on dry specimens collected at ''Gran Campo'', 5 miles east from Asunción, in Paraguay. This location is found not far from the place where the type of *Amaryllis hassleriana* Chod. et Lendn. (1901) had been gathered. I have not seen the respective type-specimens; nevertheless, it seems obvious from the descriptions that both binomials represent a single species.

In February, 1965, I made a collecting trip to Paraguay and Brazil and was able to explore the fields of Asunción, Caacupé, San Bernardino, Villa Rica and other regions. In these places, which are not very far from each other, a white *Zephyranthes* was found to be very common. The species was readily identified as the widely distributed *Z. mesochloa* Herb. On the way back through Brazil to Buenos Aires, the plant was collected once more near Cacapava do Sul (State of Río Grande do Sul). The species was well known to me, since I already had it in my experimental collection from bulbs gathered several years before at Villa El Alto(province of Santiago del Estero), and near Trancas, (Tucumán), in Argentina. On the other hand, Herbert's original description is accompanied by an excellent color illustration, which hardly leaves any doubt about its identity. By the facts presented we can easily reach the conclusion that *Zephyranthes bakeriana* and *Amaryllis hassleriana* are conspecific with *Z. mesochloa.* Therefore,

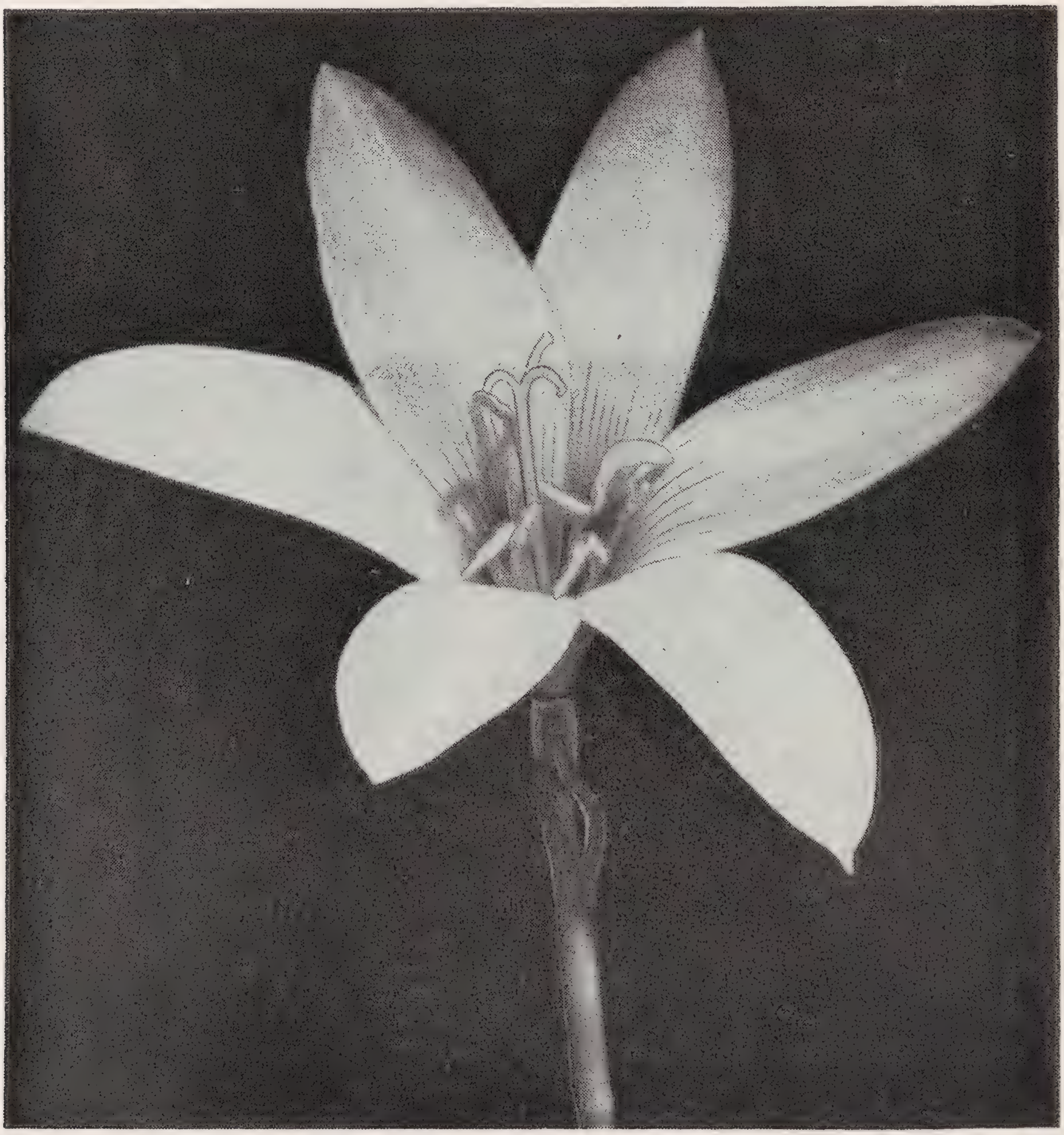

Fig. 12. **Zephyranthes mesochloa** Herb.; cultivated from bulb collected in South Brazil. Photo by Pierfelice Ravenna.

Hunziker's lack of information concerning *Z. mesochloa*, a well known species already recorded in Argentina and Brazil, seems difficult to explain.

Zephyranthes stenopetala Bak. (1898) had been described from specimens collected by Cantera on the banks of the Santa Lucía river, near Montevideo, Uruguay. Some time ago, I received a photograph of the type-sheet by courtesy of Kew Gradens. This revealed that *Z.*

stenopetala is an additional synonym of *Z. mesochloa.* The shape of tepals varies in the species from oblanceolate to almost linear; their breadth being also somewhat variable. It seems also that the flowers in the type-sheet of *Z. stenopetala* had been improperly dried, or it may have been that the plants were not pressed immediately after being gathered. This caused the tepals to become convolute, looking narrower than they actually are.

Zephyranthes timida Holmberg (1903), and *Z. oxypetala* Speg. (1917), had both been described from material from the province of Misiones (Argentina), the former from Santa Ana and the latter from the neighborhood of Posadas. These specimens have never been located and they are surely lost. Nevertheless, the orginal descriptions of both entities fit reasonably with that af *Z. mesochloa.* In December, 1969, I found *Z. mesochloa* in the fields of the Zaimán Agricultural Farm, which is near Posadas. The species is quite frequent southwards through Corrientes to Entre Ríos, and also in Córdoba, Santiago del Estero and Tucumán, in Argentina.

Zephyranthes mesochloa Herb. (Fig. 12)

Herbert, Edward's Bot. Reg. 16: sub tab 1345 et tab. 1361. 1830.—*Zephyranthes acuminata* Herbert, *loc. cit.* 16: sub tab. 1345. 1830.—*Z. flavescens* Herbert, loc. cit.—*Amaryllis mesochloa* (Herb.) Grisebach, Abhandl. Königl. Gesell. Wissensch. Götting. 19: 221. 1874.—*Amaryllis entreriana* Hoffmansegg, Linnaea 43: 137. 1880-82.—*Zephyranthes entreriana* (Hoffmsgg.) Pax, Engler Bot. Jahrb. 11: 320. 1890.—*Z. bakeriana* Morong, Ann. N.Y. Acad. Sci. 7: 239. 1893.—*Amaryllis hassleriana* Chodat et Lendner, Bull. Herb. Boiss. ser. II, 1 :422 1901.—*Zephyranthes timida* Holmberg, An. Mus. Hist. Nat. Buenos Aires, ser III, 2: 77. 1903.—*Z.oxypetala* Spegazzini, Physis 2: 41. 1917.—*Z. stenopetala* Baker, Kew Bull. 1898: 226.—*Z. hassleriana* (Chod. et Lendn.) Traub, Pl. Life 6: 60. 1950.—Pro syn.: *Zephyranthes kurtzii* Hunziker, Kurtziana 5: 361, fig. 5. 1969.

Selected specimens: Argentina, prov. of Tucumán, dept. Tafí Siambón, 1200 m; leg. S. Venturi 3930, 28-X-1925 (LIL). Idem ibid., 1300 m; leg. Schreiter 6767, XII-1931 (LIL). Idem ibid. Puerta de San Javier; leg. Schreiter 1709, 20-XI-1921 (LIL). Idem, Sierra de San Javier, Alto San Pablo, 1200 m; leg. Lillo 4589, 15-X-1905 (LIL). Idem, La Ciénaga, 2600 m; leg. Lillo (LIL 96279). Idem, dept. Trancas, Raco, 1500 m; leg. Schreiter 1406, 27-XI-1920 (LIL). Idem ibid., 1000 m (flowered in Tucumán); leg. Schreiter 6755, XII-1931 (LIL). Idem, Trancas, 900 m, among rocks; leg. Venturi 1968, 13-XI-1922 (LIL). Idem, Boca Quebrada de Gualinchay (S. Pedro de Colalao); leg. Lillo, X-1915 (LIL 30760). Dept. Burruyacu, Cerro del Campo, 1400 m; leg. Hueck 1007, 30-XI-1950 (LIL). Idem, Trapunco, 1700 m; leg. Schreiter 5494, 7-II-1927 (LIL). Dept. Leales, Chañar Pozo, 300 m; leg. Venturi 622, XI-1919 (LIL). Province of Córdoba, raro inter frutices ad Las Peñas; leg. Lorentz, 1872 (BA 37827, BA).

Paraguay, San Bernardino, in campo; leg. Hassler 3471, XI (P, practically a topotype of **Amaryllis hassleriana** Chod. et Lendn.).

Brazil, Santa Catarina, São Joaquím, Invernadinha; leg. P.B. Rambo, 20-I-1958 (PACA 64306).

Zephyranthes kurtzii Hunz. does not seem to differ materially from *Z. mesochloa*. A plant which I observed at Cerro de los Mudaderos, Sierra de Catamarca, Arg.), is unquestionably the same as Hunziker's plant. This author found *Z. kurtzii* on the Sierra de Ambato, a branch of the same mountain system as the Sierra de Catamarca. I did not find any special feature to distinguish it, at least in the specific rank.

IV. STUDIES IN THE GENUS **HABRANTHUS**

1. New species from Argentina, Brazil and Uruguay

Habranthus guachipensis sp. nov.

A *Habrantho salinarum* affinis sed flore valde majore lobis stigmae leviter longiores recedit.

Bulbus 25-30mm longus, 21-27 mm latus. Folia linearia crassiuscula ad 0.6-1.5 mm lata. Spatha 27-30 mm longa usque 8-11 mm longa fenestrata vel integra. Inflorescentia 1-flora. Flos albus 45-50 mm longus. Filamenta stricte fasciculata. Stylus declinato-ascendens ad 33-34 mm longus. Stigmae lobi recurvati circ. 2 mm longi.

Plant 18-20 cm high. *Bulb* almost globose or broadly ovoid, 25-30 mm long, 21-27 mm in diam., produced for 20-50 mm long into a *pseudoneck*. *Leaves* present at anthesis, linear, somewhat fleshy, 12-22 cm long, 0.6-1.5 mm broad, narrowly channelled. *Scape* about 11-12 cm long, 1.8-2.7 mm broad. *Spathe* one-flowered, 27-30 mm long, tubulose for 8-11 mm, with a fenestrate or rarely entire apex. *Pedicel* 18-22 mm long. *Ovary* obtusely trigonous, ca 4.5 mm long, 2.2 mm broad. *Perigone* narrowly funnel-shaped, white, 45-50 mm long. *Tepals* oblanceolate, joined for 3-3.5 mm at the base, about 44.5-49 mm long, 9 mm broad. *Filaments* closely fascicled; upper episepal ca 12 mm long, lateral episepal 15-16 long, lower epipetal ca. 19 mm long, lateral epipetal about 22 mm long. *Anthers* semilunate, 2-2.5 mm long. *Style* declined-ascending, 33-34 mm long. *Stigma* lobes markedly recurved, ca. 2 mm long.

Specimens: Argentina, prov. of Salta, Quebrada de Guachipas; leg. Castellanos, 23-I-1943 (type BA 46672).

Habranthus guachipensis is not likely to be confused for any other known species, except for *H. salinarum* Rav. The latter, a native of the province of Córdoba, has a smaller flower with shorter stigma divisions. The collection listed above, is the only one known for the species.

Habranthus catamarcensis Rav. sp. nov.

A *Habrantho tubispatho* balde affinis sed foliis angustioribus linearibus-subteretibus fusco-viridis flore fusco-aurantiaco differt.

Folia dua ad anthesin praesentia anguste linearia-semiteretia levissime canaliculata fusco-viridia haud pruinosa crassiuscula, ad 12-15 cm longa circ. 1-1.7 mm lata. Spatha 20-40 mm longa ad 10-30 mm tubulosa. Perigonium late infundibulatus fusco auranthiacus circ. 18-20 mm latum.

Plant about 10-12 cm high. *Bulb* almost globose, 17-20 mm in diam., produced into a pseudoneck. *Leaves* synanthious, about two, narrowly linear-semicylindrical, very slightly channelled, a dark green, not pruinose, almost fleshy, 12-15 cm long, 1-1.7 mm broad. *Spathe* 20-40 mm long, tubular for 10-30 mm. *Perigone* widely infundibulate, a dark orange, about 18-20 mm in diameter.

Hab.—Sandy exerophytic plateau, at foot of the Andes, in the province of Catamarca, Argentina. The writer has found it some kilometers south from the village of Londres. The plant was growing in an open area with *Opuntia ficus-indica* or a similar type, as dominant. Other common elements in the environment were *Trichocereus pasacana* and *Tephrocactus* sp., along with bushes of several families.

Specimens: Inter Londres and La Aguada in provincia Catamarca Argentinae; leg. Ravenna 10, 11-1960 (typus in Herbario Ravennae).

A single specimen of this apparently very rare species was collected by me a long time ago. Due to this circumstance, the dissection of the flower was not undertaken. Nevertheless, the characters in the description above distinguish the species well. At the time when the plant was found, it was thought to be a form of *H. tubispathus.*

Habranthus ruizlealii Rav. sp. nov.

Species a *Habrantho riojano* semilis sed inflorescentia interdum 2-flora lobis stigmae brevioribus 1.5-2.4 mm longis differt.

Plant 16-24 cm high. *Bulb* ovoid 45-47 mm long, 33-35 mm in diameter, covered with brown coats and produced into a 45-50 mm long *pseudo-neck. Leaves* at anthesis incipient, linear, 2-2.5 mm broad. *Scape* 10-16 cm long, 2.5 mm broad. *Spathe* 1-2-flowered, slightly reddish, membranous, tubulose for 20.5-28.5 mm, bifid for 13-20 mm. *Pedicels* 28-38 mm long. *Flowers* white or pink, 38-45 mm long. *Ovary* club-shaped, obstusely trigonous, ca. 6.5 mm long, 1.5 mm broad. *Tepals* oblanceolate, connate at the base for 2.8 mm, about 39-47 mm long, 8-10 mm broad; the outer apiculate, the inner acute. *Filaments* declined; the upper episepal ca. 8 mm long, lateral episepal 9.5 mm long, lower epipetal 17.5-25 mm long, lateral epipetal 19-30 mm long. *Style* declined 28-35 mm long. *Stigma* divisions recurved, 1.5-2.4 mm long.

Specimens: Argentina, prov. of La Rioja, between Chaña and Castro Barros; leg. A Ruiz Leal 16571, 20-I-1955 (type in Herb. Ruiz Leal, Mendoza).

Closely related to *Habranthus riojanus* Rav.; differing however, in the often two-flowered inflorescence, and in the much shorter stigma divisions. It gives me great pleasure to dedicate this species to Prof. A. Ruiz Leal, the distinguished botanist of the University of Mendoza.

Habranthus duarteanus Rav. sp. nov.

A *Habrantho irwiniano* planta robustiora et flore valde majore pariter ventricoso, a *H. tubispatho* qui valde simili folia angustiora et perigonii colore differt.

Plant 12-15 cm high. *Bulb* subglobose or ovoid, 20-24 mm long, 13-20 mm in diam., produced into a 15-22 mm long pseudo-neck. *Leaves* incipient at anthesis, narrowly linear, somewhat thickened, about 1 mm broad. *Scape* cylindrical, to 8 cm long, 2-2.5 mm in transverse section. *Spathe* one-flowered, membranous, 24-30 mm long, tubular for 15-18 mm, bifid for 6-9 mm. Pedicel 17-22 mm long. *Ovary* almost ellyptic 4-5 mm long, 2-2.2 mm in transverse diameter. *Perigone* slightly ventricose below, 32-38 mm long, 15-18 mm in diam. *Filaments* declined, lower episepal 13-14 mm long, lateral episepal 15-16 mm long, lower epipetal 19-20 mm long, 20-22 mm long. *Style* declined, curved, 21-23 mm long. *Stigma* trifid, its lobes recurved, 1.5-2 mm long.

Hab.—Mountains of Central Minas Gerais, Brazil; known only from the type-locality.

Specimens: Brazil, Minas Gerais, mun. Agua Limpa, próxima á Cervejaría Mineira, BR 3; leg. A.P. Duarte 10595, 16-X-1967 (typus Herb. Ravennae, isotypus RB).

This is the second *Habranthus* species which is recognized in the State of Minas Gerais; the first was *H. irwinianus* Rav., a native of the Southeastern part of the Serra do Espinhaco. Both species are easily distinguished by the size and shape of the flower. *H. duarteanus* has been named in honor of its collector, the distinguished botanist Prof. Apparício Pereira Duarte.

Habranthus goianus Rav. sp. nov.

A *Habrantho sylvatico* valde affinis sed foliis latioribus pallidioribus floribus roseis concoloribus recedit.

Plant about 23 cm high. *Bulb* ovoid, 28-32 mm long, 20-24 mm wide, produced into a 40-45 mm long pseudo-neck; outer coats dark. *Leaves* none at anthesis. *Scape* 13-25 cm long. *Spathe* 22-28 mm long, bifid for 9-11 mm, rarely almost entire. *Flower* solitary, pedicelled, pink, 48-64 mm long, 30-35 mm in diam. *Pedicel* 33-37 mm long. *Ovary* obovate, 3.9-4.9 mm long, 2.4-2.8 mm in transverse section. *Tepals* oblanceolate, joined for 3.5-4 mm at the base, 48-64 mm long, 9-10 mm broad, the outer apiculate, the inner acute. *Filaments* declined; lateral episepal 21-26 mm long, upper episepal 23-32 mm long, lower epipetal 28-34 mm long, lateral epipetal 32-37 mm long. *Anthers* versatile 3.8-4 mm long. *Style* 44-51 mm long. Stigma shortly trifid, its lobes recurved 1.5-2 mm long.

Specimens: Brazil, Goiás, Belem-Brasilia highway, 5 km north of Nova Colinas, ''cerrado''; leg. G. T. Prance & N. T. Silva 58502, 31-VII-1964 (typus UB, isotypus N.Y.).

This species is closely related with *Habranthus sylvaticus* Mart. ex Roem. et Schult., differing in the flower pattern and in the leaves. In

1966 Eng. E. P. Heringer of the University of Brasilia, showed me a living plant of this species in his garden. The bulb was collected in the vicinity of the City. The leaves were rather board and of a light green. I have gathered *H. sylvaticus* in the "caatinga", about 8 km north from Petrolina (Pernambuco), not far from the San Francisco river. The leaves in the latter are narrower and somewhat darker.

Habranthus estensis Rav. sp. nov. (Fig. 13)

Habranthus inflorescentia biflora raro uniflora floribus valde apertis pulchre roseis instructus. A *H. concordiae* species valde proxima est sed foliis paullo angustioribus fusco viridis haud pruinosis floribus brevioribus magis apertis, a *H. pedunculoso* et *gracilifolio* quibus inflorescentian saepe bifloram habent foliis linearibus marginibus attenuatis differt.

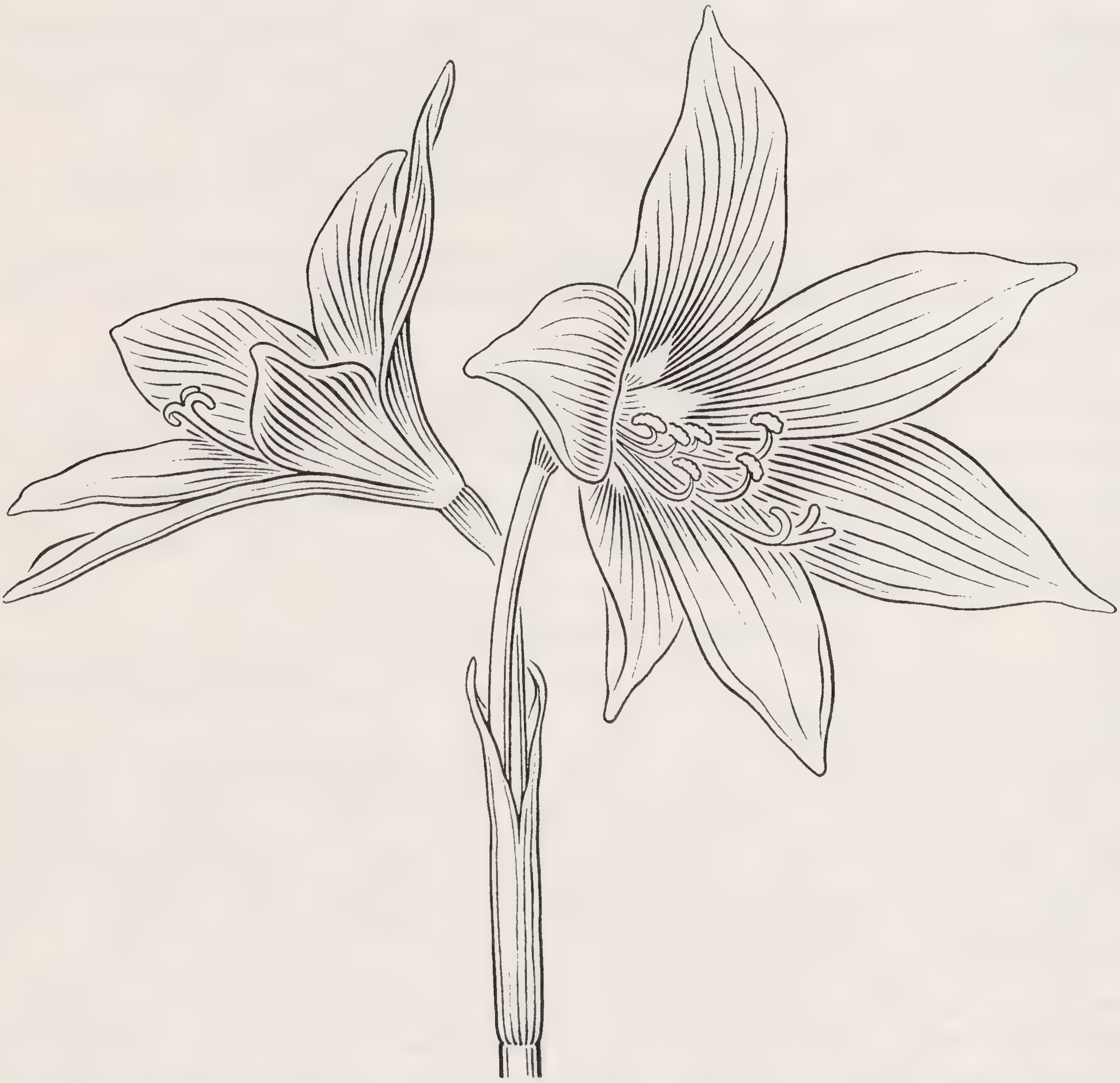

Fig. 13. **Habranthus estensis** Ravenna. Inflorescence, approx. natural size. Drawing by Pierfelice Ravenna.

Plant 20-30 cm high. *Bulb* subglobose or depressed-globose, 25-30 mm in diam., covered by dark membranous coats, and with a 25-35 mm long pseudo-neck. *Leaves* absent at anthesis or rarely a single present, often serotine, linear, channeled, flaccid, a dark green, not pruinose, 13-20 cm long, 3-4 mm broad. *Scape* often of the same length as the longer leaf, a pale ocher-green, often purplish in the lower third. *Inflorescence* two flowered or, less frequently, one-flowered. Spathe 20-47 mm long, bifid for 6-15 mm, a pale brownish-pink or greenish. *Pedicels* 26-30 mm long. *Flowers* 24-34 mm long, 45 mm in diameter when fully expanded, with a small greenish star at the throat. *Ovary* obovate or elliptical, 4-5 mm long, 2-2.2 mm broad. *Tepals* oblanceolate, joined for 2.5 mm at the base, about 25-27 mm long, the outer 9 mm broad; lateral inner series 8 mm broad, lower-inner 6.7-7 mm broad. *Filaments* declined; the upper episepal to 6 mm long, lateral episepal about 7 mm long, lateral epipetal 8-9 mm long, lower epipetal 10-12 mm long. *Anthers* reniform, yellow, 2.5-3 mm long. *Style* declined, 16-18 mm long. *Stigma* divisions about 2.5 mm long. *Capsule* obovate, moderately tricoccous, about 15 mm long, 12.5 mm in diameter. Seeds semicircular rarely almost circular, somewhat thickened, black, shiny, thinner or membranous at the margins, 3.4-5.4 mm long, 3.4-4 mm broad.

Hab.—Stony or sandy places at Punta Ballena, and near Punta del Este, in the Uruguay Republic. In the former location it is found near *Nothoscordum balaenese* Rav., *Habranthus gracilifolius, Tristagma recurvifolium, T. uniflorum, Nothoscordum bonariense, Stenandrium trinerve, Oxalis machin,* and others.

Specimens: Culta in Bonaria ex bulbis a doctore John Christie ad Punta-Ballenam Pruguriae collectis; leg. Ravenna 1031, IV-1969 (typus in Herbario Ravennae). In arenosis prope Punta del Este Uruguariae; leg. Ravenna 1380, IV-1971 (Herb. Rav.).

This handsome species might be confused with *Habranthus gracilifolius* Herb., which grows in the same ecological niche. *H. estensis* differs from the latter in the texture and thin margins of leaves, and in the widely expanded flowers. *H. concordiae* Rav., from Entre Ríos (Argentina), and *H. longipes,* from Uruguay, have longer flowers with narrower tepals; in the latter the inflorescence is one-flowered. *H. pedunculosus* Herb., from Argentina, Brazil, Uruguay (?) and Paraguay, has cylindrical, fistulose, leaves.

There is a specimen from the vicinity of Mar del Plata (prov. of Buenos Aires), in the Argentine Museum of Natural History, which seems to agree with this species. Nevertheless, further studies with living plants from this locality are needed in order to verify this point.

Bulbs of *H. estensis* were brought from Punta Ballena, Uruguay, Dr. John Christie, along with other interesting plants, such as the recently classified *Nothoscordum balaenense* Rav. (1971). The former species was found by me also in sandy places near Punta del Este.

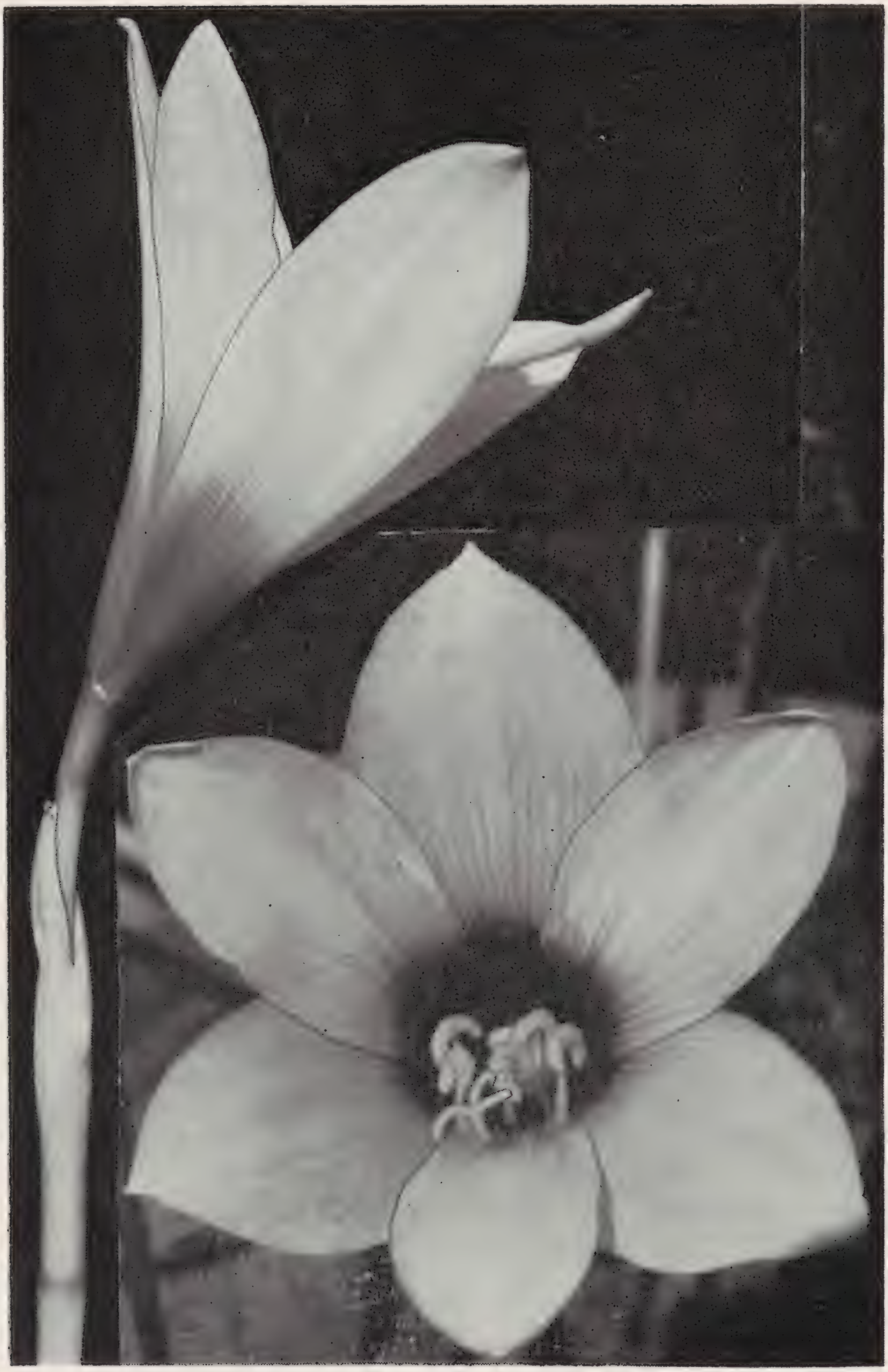

Fig. 14. Habranthus **barrosianus** Hunziker et Di Fulv. **Left** side view of flower as cultivated at Santiago, Chile. **Right,** upper view of flower. **Photos** by Pierfelice Ravenna.

2. Habranthus barrosianus Hunz, et Di Fulv. (Fig. 14)

Descr. ampl., Hunziker & Di Fulvio, Kurziana .7: **133.1973**

Plant 15-25 cm high. *Bulb* ovoid or subglobose, about 18-22 mm wide, covered by dark brown coats and prolonged into a 18-25 mm long pseudo-neck. *Leaves* vernal, absent at anthesis, prostrate, markedly channelled to almost flat, a pale green, often glaucescent, to 14-20 cm long, 2.7-5 mm broad. *Scape* cylindrical, a pale green and reddish below, or a pale reddish-brown from base to top, about 8-15 cm long. *Spathe* 27-35 mm long, bifid for 9-13 mm, a pale brownish-red except at the greenish apex. *Inflorescence* one-flowered. *Pedicel* 37-60 mm long, a pale brownish-red, or a dirty greenish. Ovary claviform to cylindric, brownish-green, about 6-7 mm long, 2.8 mm wide. *Perigone* inclined, funnel-shaped, brownish or reddish-brown for 17-21 mm, below, a pale pink above, about 40-55 mm long, 40-50 mm in diam. *Tepals* broadly oblanceolate, joined at the base for 2.5 mm; the outer 43-53 mm long, the upper 11-21.8 mm broad, the lateral 9.5-17.5 mm broad, the apiculum 1-1.5 mm long; the inner 40-52 mm long, the lateral 8.5-17.3 mm broad, the lower 8.5-11.8 mm broad. *Filaments* whitish or sometimes whitish-pink; the lateral episepal 9-12.5 mm long, upper episepal 13-16.5 mm long, lower epipetal 16-23.5 mm long, lateral epipetal 21-26.5 mm long. *Anthers* semilunate, yellow, about 2.9-4 mm long. *Style* whitish or a very pale pink except the whitish apex, about 30-35 mm long. *Stigma* whitish, its lobes recurved, about 2.6-2.8 mm long.

Habitat.—A native of the Tandilia orographic belt of the province of Buenos Aires (Argentina), and also, apparently, in Uruguay. It has been found on a ''table hill'' at estate ''La Pelegrina'', between Mar del Plata and Balcarce, growing among stones close to *Habranthus tubispathus, Anemone decapetala,* and *Gymnocalycium* sp.

Specimens: Culta in Santiago Chiliae ex bulbis in praedio ''La Pelegrina'' prov. Bonaria Argentinae collectis; leg. Ravenna 2048, XII-1972 (in Herb. Ravennae, TRA, LP). Uruguay.

Habranthus barrosianus resembles *Habranthus martinezii* Rav. mainly in the flower color. It differs, however, in the leaf morphology, the perigone size and shape, and the much broader tepals. The specimen from Uruguay, cited above, is tentatively referred to this species.

3. Habranthus variabilis (Rav.) comb. nov.

Habranthus tubispathus (L'Her.) Traub ssp. *variabilis* Ravenna, Pl. Life 26: 102. 1970.—*H. tubispathus* ssp. *variabilis* Rav. var. *roseus* Ravenna, *loc. cit.* 26: 103. 1970.— *H. tubispathus* ssp. *variabilis* Rav. var. *bicolor* Rav., *loc. cit.* 26: 103. 1970.—Pro syn.: *Habranthus andersonianus* Herb. var. *parvula* Herbert, Amaryll.: 168, pl. 26, fig. 4. 1837.

Having examined additional material of this entity, I feel convinced now, that it deserves species rank. The varieties *roseus* and *bicolor,* both proposed by me, seem to have little taxonomic importance. Similarly, the flowers of *Rhodophiala chilensis,* in the same population can be scarlet, purple or yellowish.

Habranthus andersonianus var. *parvula* Herb., seems to be the same as *H. variabilis.* The species is here reported in the flora of Paraguay.

Specimens: Ad viam ferream inter Paso de los Libres et Monte Caseros prov. Corrientes Argentinae; leg. Ravenna 446, III-1965 (Herb. Rav., typus) Prov. Santa Fé, dept. Reconquista, Ocampo; leg. S. Venturi 182, 25-III-1904 (BA 16728), in swamps.

Paraguay, Ibiaty; leg. Joergensen 3876, III (BA 28/1675), common in the fields.

4. On the identity, synonymy, and distribution area of **Habranthus pedunculosus** Herb.

Habranthus pedunculosus Herb. (1837), has been considered by authors as a synonym of *Rhodophiala bifida,* until Ravenna (1970, p. 103) demonstrated that it is a valid *Habranthus* species in the present restricted sense of the genus. At that time, however, the identity of the species was somewhat obscure.

In January, 1971, I attempted to solve the problem concerning the plant that was reported in the flora of Buenos Aires as *Habranthus robustus* (see Cabrera 1953). With this purpose I explored the gentle slopes (''Barrancas'') above the Paraná banks, between Zárate and the Las Palmas estate. The latter was the location where ''Habranthus robustus'' had been supposedly found.

At first the only Amaryllid that was seen, growing under shade of *Bauhinia candicans* and among bushes of *Lantana montevidensis,* was *Rhodophiala bifida.* It seemed unlikely that this could have been confused with *Habranthus robustus* by Cabrera (1953). After searching several hours in the difficult ground of the ''barranca'', I reached the upper part and came out from the close vegetation. Here, a second Amaryllid was found: *Habranthus teretifolius* (C.H.Wr.) Traub (sensu Hunziker 1967). Apparently this was the plant that had been misidentified with *Habranthus robustus* by Cabrera, and included with the latter name in the ''Flora de la Provincia de Buenos Aires'' by Fabris (1969).

While the population was being examined, an interesting fact was observed: in the soft soil under bushes plants were stout; whereas, in the nude, hard soil, plants showed a very short scape, sometimes two centimetres or less long. I remembered that almost the same phenomenon happened at the Botanic Garden of Castelar, where the species often spread naturally from the collection. This occasional condition contrasted with the comparatively long pedicels. These plants were identifiable with the early and until recently not recognized *Habranthus pedunculosus* Herb.

Due to the facts of above, the report of *Habranthus teretifolius* ''for the first time'' in Argentina (Corrientes) by Hunziker (1967) is probably invalid. *Habranthus pedunculosus,* a much early binomial, has been recorded in Buenos Aires since its publication by Herbert in 1837. The "barrancas" of the Paraná river were probably the original location where Tweedie found the plant. On the other hand, the species has already been reported in the province of Corrientes under the synonym *Habranthus juncifolius* Traub & Hayward. The flowers in the type-specimen of *H. pedunculosus* (after which Herbert's illustration was made) show rather narrow tepals, but this circumstance is due probably to the fact that they become convolute as a result of being allowed to wither before they were pressed.

I feel considerable reluctance in associating the binomial *H. teretifolius (C.H.Wr.)* Traub with *H. pedunculosus.* According to Wright it had been raised at Kew from seeds collected by Cantera at Montevideo. Unfortunately, he did not prepare a dry specimen. I made several collecting trips to different parts of Uruguay, including the Capital region, but have never seen the latter species. Moreover, it is not represented in the Herbaria of that Country. There might be, in my opinion, two possibilities on this matter:

(1) The seeds were not actually collected near Montevideo. This leaves ground to conjecture that they could have been collected in the North-West region of Uruguay, near the border with Corrientes and Entre Ríos; the species is quite frequent in the latter provinces of Argentina.

(2) *Habranthus teretifolius* is a synonym of *H. gracilifolius* Herb., a native of Montevideo, which has thickened leaves with rounded sides that could be defined as "foliis teretibus"; these sometimes reach 3 mm in breadth. The flowers in *H. gracilifolius* are variable in size and not infrequently they agree with the measurements given by Wright in his description of *H. teretifolius.* In *H. gracilifolius* the inflorescence is 1-2 (3)-flowered

Both of the above possibilities are valid, but impossible to verify, since Wright's description is deficient in details, and since there is no type-specimen for comparison. Due to the lack of Uruguayan material of *Habranthus pedunculosus.* I feel inclined to the second hypothesis. The synonymy and distribution of the species follows.

Habranthus pedunculosus Herb.

Herbert, Amaryll.: 161, pl. 26, fig. 3. 1837.—*Hippeastrum pedunculosus* (Herb.) Baker, Trimen Journ. Bot. 16: 83. 1878.—*Hippeastrum teretifolium* C. H. Wright (?), Gard. Chron. 28 (2): 142. 1900.— *Habranthus juncifolius* Traub & Hayward, Herbertia 7: 40. 1947.—*Habranthus tereifolius* Traub & Moldenke, Amaryllidaceae tribe Amaryll.: 145. 1949.

The specimens that appear below, are the only ones that I am able to list now. They are not representative of the range of the species.

Hab.—Buenos Aires, Argentinan Mesopotamia (Entre Ríos, Corrientes and Misiones), Santa Fé, Chaco (near Resistencia), in Argentina, Brazil, Paraguay and Uruguay (?).

Specimens: Argentina, prov. of Buenos Aires, between Zárate and the Las Palmas estate, on the upper part of the "barrancas"; leg. Ravenna 1974, I-1971 (Herb. Ravenna). Culta in Horto Botanico Castelarensi; leg. Ravenna 811, III-1966 (Herb. Rav., BAB). Culta in Bonaria ex Bulbis a A. Schulz pr. Resistencia provinciae Chaco Argentinae collectis; leg. S. Magno, III-1972 (Herb. Rav.).

Brazil, Río Grande do Sul; leg. B. Rambo? (PACA 63639).

5. **Zephyranthes taubertii** reduced to synonymy of **Habranthus robustus**, and additional notes on this species

Herbert ex Sweet, Brit. Fl. Gard. ser. II, 4: tab. 14. 1831.—*Amaryllis robusta* (Herb. ex Sw.) Spach, Opera Hist. Nat. Pl. Phan. 1834.—*Amaryllis berterii* Sprengel, Linn. Syst. Veg. 2: 49. 1825.—*Zephyranthes taubertii* Harms, Gartenfl. 43: 281, tab. 1487. 1896.

The original description and illustration of *Zephyranthes taubertii* show that this binomial is a synonym of *Habranthus robustus.* The latter has been collected in the State of Paraná (Brazil) by Prof. Hatschbach, but apparently not as a true native. During the trips we made together in 1969, it has been observed by us growing freely in the modified fields, and always not far from places inhabited by man. Since the plant is often cultivated, we reach the conclusion that it might be a ruderal, at least in Paraná. In the vicinity of Posadas, prov. of Misiones (Argentina), I had the opportunity of seeing that the species tends to escape from gardens.

6. Notes on **Habranthus jamesonii**

Recently I have been asked how a plant with "red" flowers as Baker's *Hippeastrum jamesonii,* could be the same as the "white" *Zephyranthes melanopotamica* Speg. A retrospective survey of both binomials is therefore needed.

The original description of *Hippeastrum jamesonii* Bak. (1878), stated that the flowers are "pale red", which means *pink.* Nevertheless, in *Handbook of the Amaryllideae* (1888), this author transcribed, probably by oversight, the color as "red".

Sealy (1937, p. 196), stated that: "On the other hand H. jamesoni, like a number of other species that have been placed in Habranthus was found to have a spathe like that characteristic of Hippeastrum, to which genus Baker had referred these species, and to which they undoubtedly belong". In spite of Sealy's viewpoint, which relied exclusively on the examination of the type-sheet, the spathe is actually not bivalved. Although almost always deeply bifid, it clearly shows below a definite tubular portion. This feature can be observed in the four specimens of the type-sheet.

I have studied living plants brought from the province of Río Negro by Dr. Allan Murray, a distinguished amateur from Buenos Aires. These were collected in the type-region of *Zephyranthes melanopotamica.* Some of them had pink flowers with darker veins, others white. As was verified later, they agreed with the type of *Hippeastrum jamesonii.* I also received dry specimens and bulbs from Dr. E. Cano, (I.N.T.A.), collecter in the province of La Pampa, and from Dr. A. Ruiz Leal from Mendoza. Plants from these sources flowered in my experimental collection. Dr. David Lee Anderson sent me dry specimens from the vicinity of Mercedes, in the province of San Luis (Argentina). The flowers in this species are heliophile: they expand well only in full sun, while only imperfectly when the sky is cloudy. This is an important feature which is not found in *Rhodophiala*.

Selected specimens: Argentina, Province of San Juan, ravines near Jáchal; leg. Jameson (photograph from the type of **Hippeastrum jamesonii,** courtesy of K.) Province of Mendoza, Cacheuta; leg. W. Díaz (SGO 46879). Idem, vicinities of Cerro Chiuiu, 35° 40′ lat. S, 69° 34′ long. W; leg. C.A. Menéndez, 12-XII-1949 (BA 54337). Idem, Tupungato; leg. Ruíz 251, XII-1916 (BA 25/1873). Idem, Dept. Luján, between Cacheuta and Potrerillos; leg. Ruíz Leal 6426, 19-XI-1939 (Herb. Ruíz Leal), "flor color rosado-cárneo". Idem, Dept. Las Heras, on arid hills near Villa Hipódromo; leg. Ruïz Leal 6362, 12-XI-1939 (Herb. Ruîz Leal), "muy abundante, flor color rosado-cárneo." Lower Rio Negro; leg. Hauman, II-1912 (BA 16757). Province of La Pampa, between General Acha and Chacharramendi; leg. O. Solbrig 184, 17-XII-1951 (BAB). Idem, between Victoria and Telen; leg. D. O King 82, 4-II-1928 (BAB).

7. Report of **Habranthus coeruleus** in South Brazil

Amaryllis coerulea Gris. (1879), basonym of *Habranthus coeruleus* (Gris.) Traub, had been originally collected by Lorentz in the fields of Concepción del Uruguay, province of Entre Ríos, Argentina. The species has been found again only recently at the Experimental Farm of Concepción del Uruguay. Actually, it seems that the species is quite rare in Argentina. Therefore, the recognition of *Habranthus coeruleus* among dry material from the Brazilian States of Paraná and Santa Catarina seems to be an interesting event.

Specimens: Argentina, prov. Entre Rïos, Concepción del Uruguay; leg. Lorentz 877, 21-III-1877 (isotype BAF), in sandy soil, after the first rains. Idem, Estación Experimental Agrícola, "potrero 64"; leg. S.B. Sorarú, 13-IV-1965 (Herb. Est. Exp. C. Urug., SI, Herb. Rav.).

Brazil, Paraná, Municipe of Lapa, Río Passa Dois; leg. Hatschbach 19722, 15-IX-1968 (Herb. Hatschb., Herb. Ravenna). Idem, Munic. Piraquara, 930 m; leg. Hatschbach 549, 24-XI-1946 (Mus. Bot. Munic. Curitiba). Idem, Munic. Ponta Grossa, Río Verde, Capao da Onca; leg. Hatschbach 17417, 11-X-1967 (Mus. Bot. Munic. Curitiba). Idem, Munic. S. José dos Pinhaes, Río Pequeno, gassy field on the slope of the "morro"; leg. Hatschbach 23195, 12-XII-1969 (Mus. Bot. Munic. Curitiba). Santa Catarina, Munic. Lajes, campo N of Lajes (along road BR-2); leg. Lindemann & Haas 3670, 15-XII-1966 (U).

8. On **Habranthus saltensis (Fig. 15)**

Habranthus saltensis Ravenna, Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 6. 1970; Plant Life 28: 125. 1972.

The species was orginally published without illustration; this is given here.

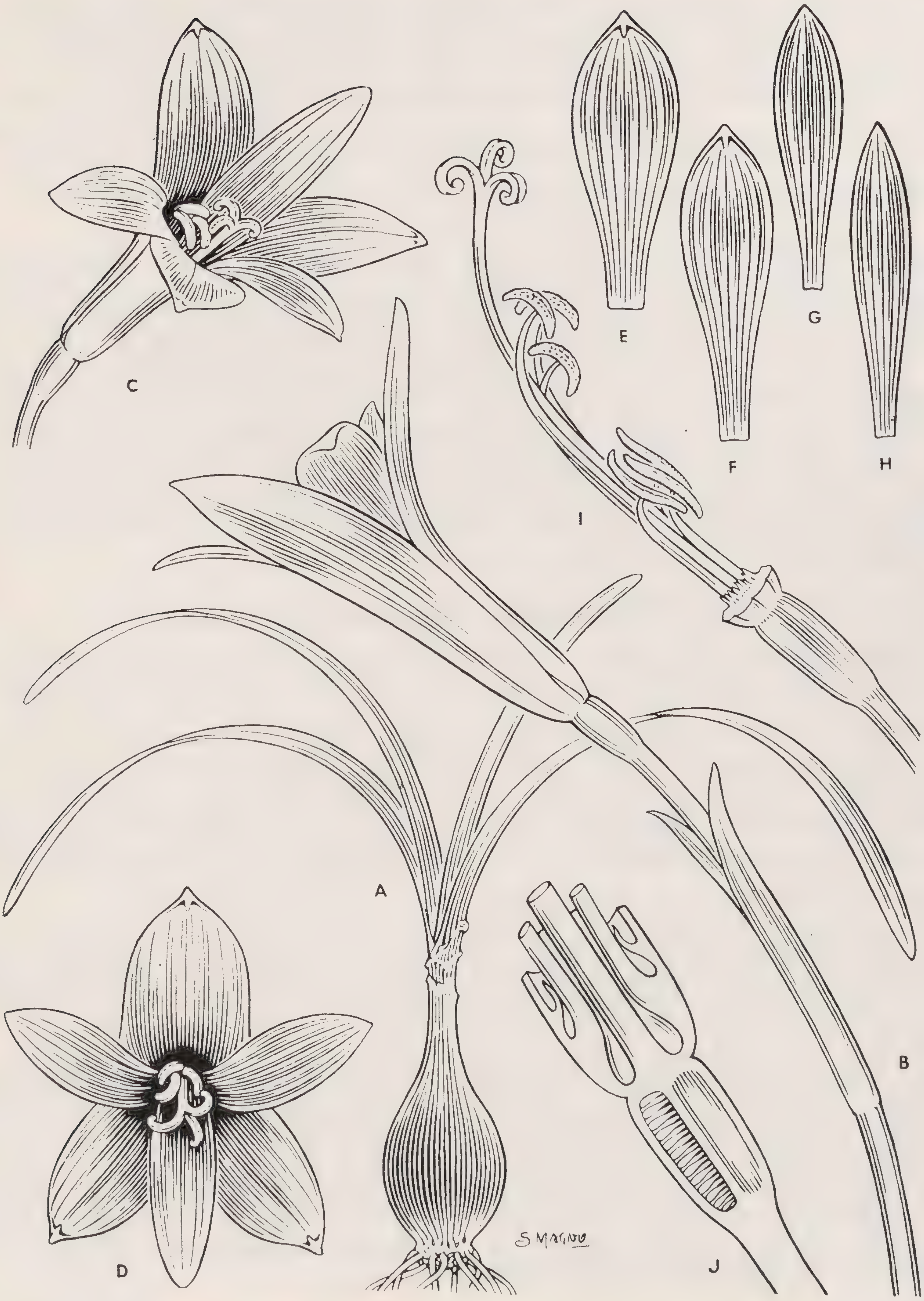

Fig. 15. **Habranthus saltensis** Ravenna. **A,** a plant with leaves (X 0.3); **B,** side view of inflorescence (X 1.1); **C,** side view of flower (X 1.1); **D,** upper view of flower (X 1.1); **E,** upper outer tepal (X 0.6); **F,** lateral outer tepal (X 0.6); **G,** lateral inner tepal (X 0.6), **H,** lower inner tepal (X 0.6); **I,** androecium (stamens) and gynoecium (pistil); note anther dimorphism (X 1.4); **J,** longitudinal section of lower part of a flower, showing ovules and insertoon of stamens, paraperigone and style (X 2.1). Drawing by S. Magno.

V. NOTES ON THE GENUS **FAMATINA**

Ravenna (1972) proposed the new genus *Famatina,* an inhabitant of the Andes of Argentina and Chile. The genus has been defined with three species: *F. saxatilis* Rav. (the type), *F. herbertiana* (Lindl.) Rav., and *F. maulensis* Rav. Due to a *lapsus calami,* the genus was included in tribe ''Habrantheae'', instead of *Zephyrantheae.*

Famatina maulensis Rav. (Fig. 16)

Ravenna, Pl. Life 28: 58, fig. 19. 1972.

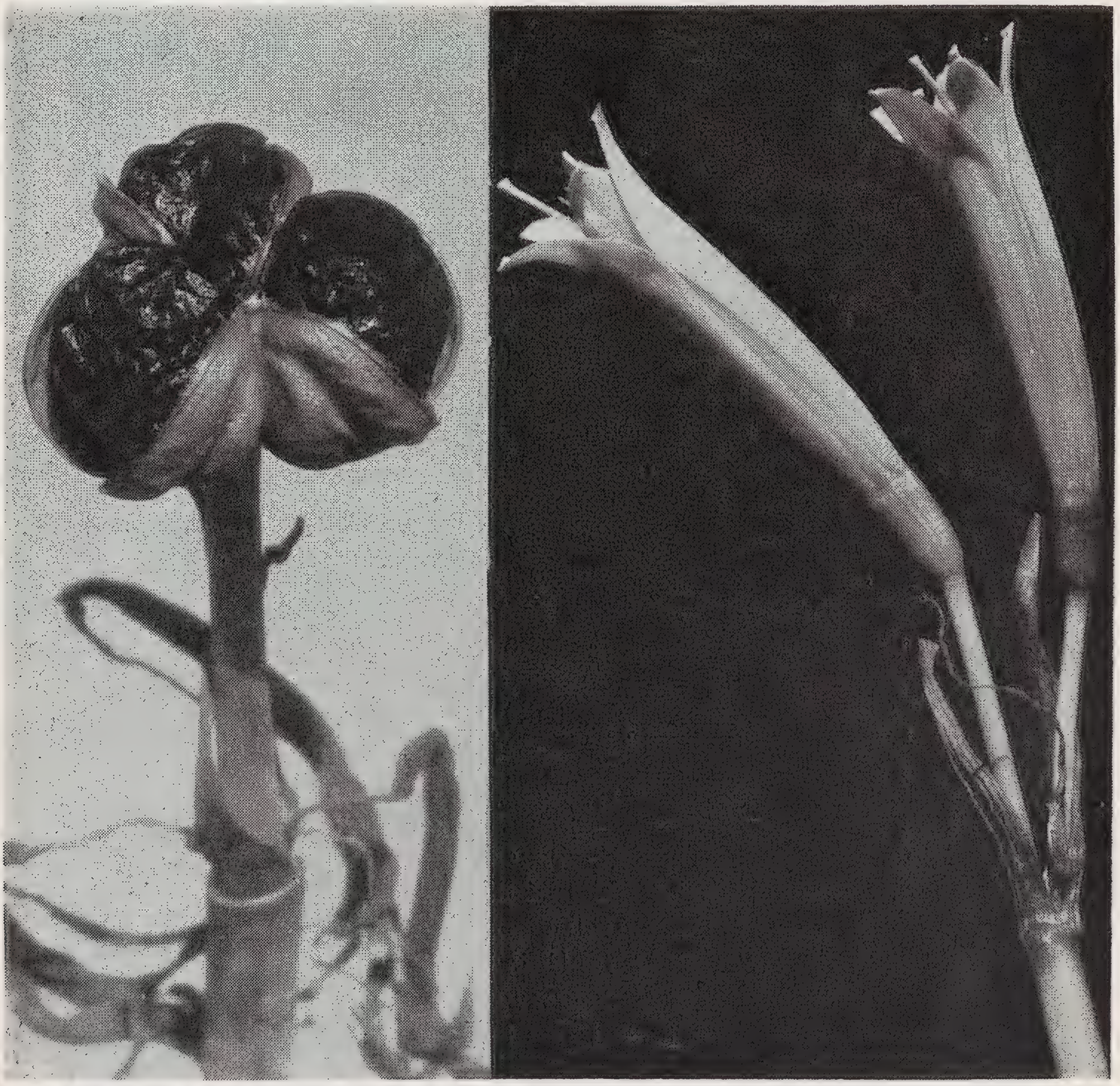

Fig. 16. **Left, Famatina herbertiana** (Lindl.) Ravenna, showing mature capsule with seeds. **Right, Famatina maulensis** Ravenna, inflorescence, as photographed in its native habitat. Photos by Pierfelice Ravenna.

Since the publication, living plants of *Famatina maulensis* and *F. herbertiana* were examined. Therefore, it is necessary to review their characters. Additionally, I give the complete synonymy and range of the latter.

Plant 20-35 cm high. *Bulb* ovoid, 36-47 mm long, 21-28 mm in diameter, covered with dark brown coats and produced into a 26-65 mm long pseudo-neck. *Leaves* 2-3, synanthious, subfistulose, with rounded margins, internally with thin, longitudinal, connected walls (as in *Placea*), a bright green, 22-30 cm long, 4-6 mm broad. *Scape* a pale reddish-brown in the upper half, reddish downwards, 22-30 cm long, 4.5-6.3 mm broad near the base, narrowing gradually toward the apex. *Spathe* valves lanceolate, purple, marcescent, about 34-64 mm long. inner bracts as much as flowers, linear-lanceolate, 14-20 mm long. *Inflorescence* 2-3-flowered. *Pedicels* a pale brownish-green or reddish, 19-30 mm long. *Ovary* obovoid, a brownish green, 4.5-5.2 mm long, 3.4-4 mm broad. *Perigone* almost tubular throughout, ascending, intesely red, 32-35 mm long, 9-12 mm in diam. at the apex. *Tepals* connate for 6-7 mm; the outer series 24-30 mm long, 4.3-6 mm broad, internally with a white streak except in the upper forth; inner series 25.8-29 mm long, 4.5-6.3 mm broad, internally with a yellowish-white streak. *Filaments* filiform, free to the base, red in the upper half, clearing downwards to a salmon-yellowish; the upper episepal 18 mm long, lateral episepal 18.6-20 mm long, lower epipetal 21 mm long, lateral epipetal 22-23 mm long. *Anthers* yellow, versatile, 2mm long. *Paraperigone* absent. *Style* filiform, 28 mm long. Stigma capitate.

Hab.—Known at present only from the upper part of the Cuesta de los Cóndores, not far from the Maule lake, in the province of Talca, Chile. Altitude about 1500 m over the sea.

Specimens: Chile, prov. of Talca, on the way to the Maule Lake, Cuesta de los Cóndores, near the ''Monjes Blancos''; leg. Ravenna 1999, XI-1971 (Herb. Rav., SGO). Idem, near Laguna del Maule; leg. Zoellner, XII-1969 (type Herb. Rav., isotype Herb. Zoellner).

In December, 1971 I explored the native area of *Famatina maulensis,* and was able to find it near the upper part of the ''Cuesta de los Cóndores'', at a lower altitude than the Maule lake (prov. of Talca). Prof. Zoellner, who was the first collector of the plant, communicated (verbally) that actually he found the species in the upper part of the Cuesta, and that the annotation ''Laguna del Maule'' in the type-sheet was a mere reference to the region, and not as to the exact location.

The living plants that I have studied *in situ* showed discrepancies from the original description, because of some misinterpretations in the study of the dry specimen. These concern the leaf morphology, the position of the flower in the inflorescence, and the non-existence of a paraperigone. A new key is therefore necessary.

1a. Leaves fistulose or almost so, with rounded edges .... 1. **F. maulensis**
1b. Leaves not fistulose, with thin edges:
  2a. Flowers horizontal or sometimes declined; scape 15-35 cm long .... 2. **F. herbertiana**
  2b. Flowers ascending. Scape 1-8 cm long .... 3. **F. saxatilis**

Famatina herbertiana Rav. (Figs. 16 and 17)

Ravenna, Pl. Life 28: 60. 1972.—*Phycella herbertiana* Lindley, Edwards Bot. Reg. 16: tab. 1341. 1830.—*Phycella graciliflora* Herbert Amaryll.: 152, 1837.—*Habranthus gladioloides* Hieronymus, Bol. Acad. Cienc. Córdoba 4: 70. 1881.—*Hippeastrum herbertianum* (Lindl.) Baker, Handb. Amaryll.: 45. 1888.—*Hippeastrum gladiolodes* (Hieron.) Pax, Engler Bot. Jahrb. 11: 321. 1890.—*Amaryllis gladioloides* (Hieron.)

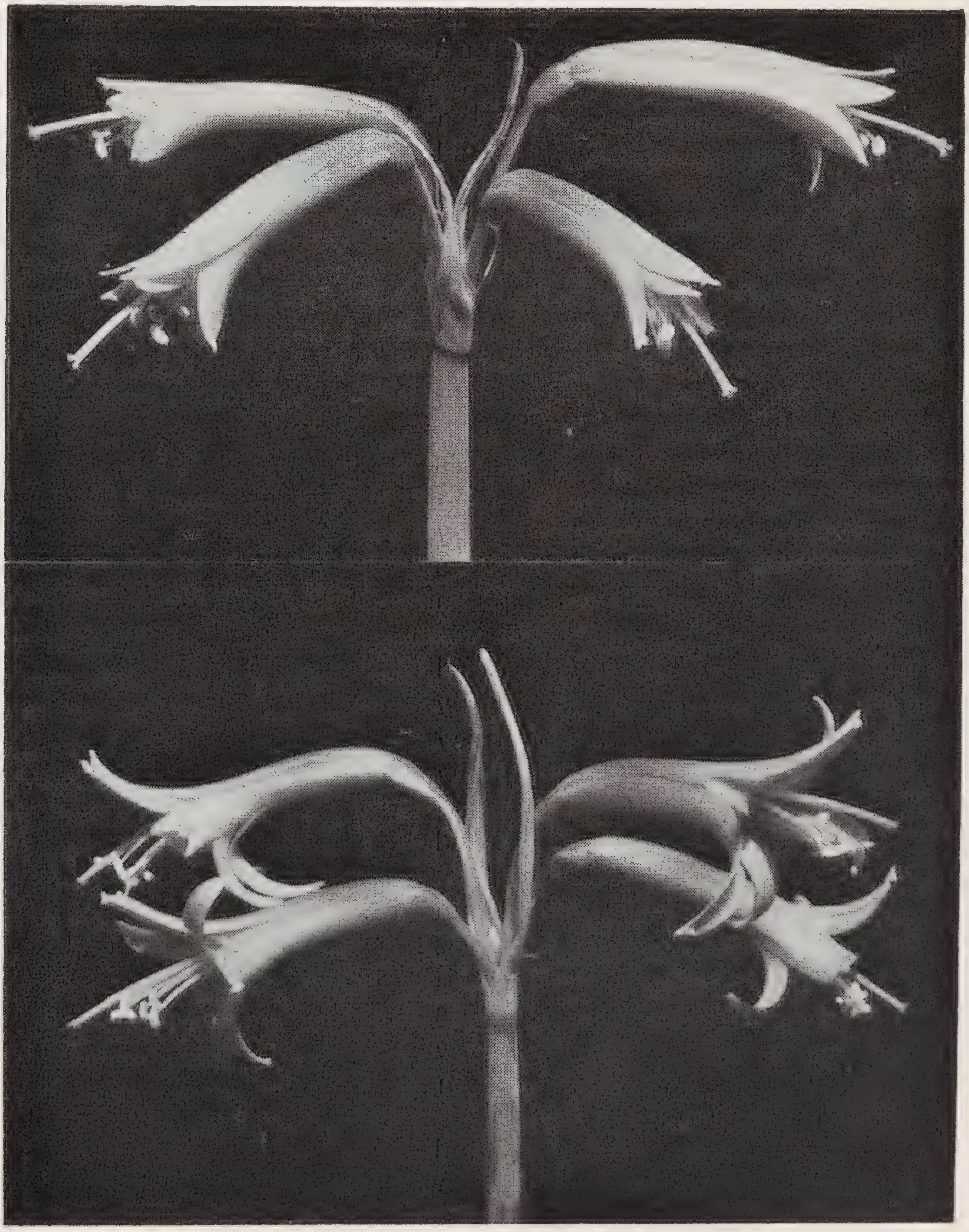

Fig. 17. **Famatina herbertiana** (Lindl.) Ravenna, inflorescence, showing two flower types of the species; note variation in the stigma shape. Photographed by Pierfelice Ravenna in their native habitat.

Traub et Uphof, Herbertia 5 : 121. 1938.—*Amaryllis herbertiana* (Lindl.) T. & U., loc. cit. : 121. 1938.

Plant 15-30 cm high. *Bulb* ovoid, 55-64 mm long, 31-50 mm in diam., covered by dark brown coats, and prolonged into a 7-13 cm long pseudoneck. *Leaves* linear, channelled, flaccid, with thin margins, green, slightly pruinose, about 15-45 cm long, 7-10 mm broad. *Scape* 10-30 cm long, yellowish-green, green, or purplish-green, about 5.9-11.5 mm broad near the base, and 5-8 mm broad at the apex. *Spathe* bivalved, reddish-green or reddish; valves lanceolate, joined at the base, then 31-53 mm long. *Inflorescence* 3-8-flowered. *Pedicels* 10.5-43 mm long. *Ovary* obovid, obtusely trigonous, greenish-red or almost green, about 5-7 mm long, 3.7-4.5 mm broad. *Perigone* red, often ventricose near the base and constricted at the middle, otherwise almost tubular, frequently markedly bilabiate, the upper inner tepals often embracing the stamen fascicle and style, about 30-53 mm long, 14-29 mm in diameter. *Tepals* oblanceolate, connate for 3.5-7 mm, often very imbricate, the upper inner pair approximate or imbricately contiguous, embraced by the upper one; outer series with a whitish streak on the inner face, about 30-44.5 mm long, 6.3-8.3 mm broad, the apicule 0.8-1 mm long, with a penniciled tubercle at the base; inner series 31-47.5 mm long, 5.5-9 mm broad. *Paraperigone* annullar, fimbriate, about 1.3-3 mm long. *Filaments* ascending, whitish in the lower half, reddish toward the apex; upper episepal 24-39 mm long, lateral episepal 26-41 mm long, lower epipetal 28-44.5 mm long, lateral epipetal 31-39 mm long. *Anthers* 2.9-3.5 mm long; pollen yellow. *Capsule* tricoccous, pale green, 11-13 mm long, 19-21 mm in diam. *Seeds* black, shiny, semielliptical, 5-6 mm long.

Specimens: Chile, prov. of Aconcagua, Río Blanco; leg. Zoellner, XI-1969 (Herb. Zoellner). Prov. of Santiago, valley of the Yeso river, between Romeral and the dam, 1900 m; leg. Ravenna 2052, XI-1972 (Herb. Ravenna, SGO, TRA, et caet.). Prov. of Colchagua, near Termas de San Fernando, 2000 m; leg. Ravenna 2055, XII-1972 (Herb. Ravenna, SGO, TRA, et caet.). Prov. of Curicó, Laguna del Teno; leg. F. Behn, II-1967 (CONC 32662).

The stigma, in the fresh flowers that I have examined, revealed to be capitate, or capitate-trilobed, to shortly trifid. The latter eventual feature has to be included in the genus description. Recent collections disclosed that this species ranges, in Chile, from the valley of the Aconcagua river to the Teno Lake, in the province of Curicó, at the altitude of 1800-2500 m.

VI. STUDIES IN THE GENUS **AMARYLLIS**

1. Four new species and a new subspecies from Argentina and Brazil

Amaryllis arboricola sp. nov. (Fig. 18)

A *Amaryllide striata* proxima sed habitu arboreo bulbo ebulbillifero differt.

Planta arboricola circ. 45-55 cm alta. Inflorescentia 2-flora. Flores coccinei ventricose deflexi (ut in *Amaryllide belladonna*) ad 10-11 cm longi circ. 12-13 mm lati.

Plant 45-55 cm high. *Bulb* ovoid, not producing bublets, about 8 cm long, 6 cm in diameter; the outer coats brown, the pseudo-neck short. *Scape* green, 40-45 cm long, 14 mm broad near the base. *Spathe-valves* lanceolate, marcescent, about 60 mm long. *Inflorescence* two-flowered. *Flowers* red with a greenish-yellow star at the throat, ventricose-deflexed below (as in *A. belladonna*) about 10-11 cm long, 12-13 mm in diameter. The rest as in *A. striata.*

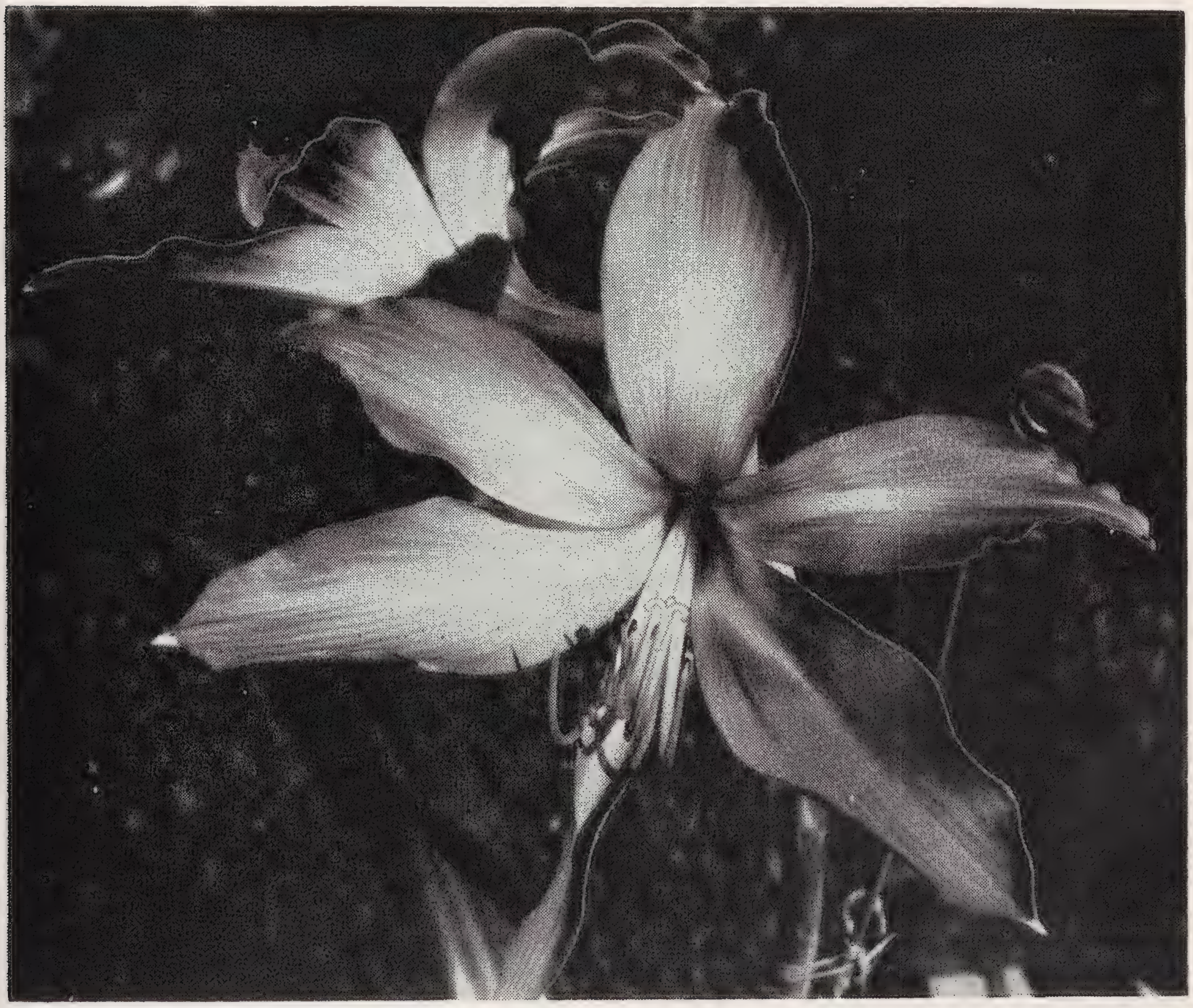

Fig. 18. **Amaryllis arboricola** Ravenna, as cultivated by Dr. Gómez, from bulb collected on fallen trees at El Dorado, Misiones, Argentina. Photo by Pierfelice Ravenna.

Hab.—An epiphyte of the high trees in the Northwestern part of the province of Misiones, Argentina. It was found near El Dorado.

Specimens: Culta a Doctore Gómez Ruppel ex bulbis in arboribus sylvis prope El Dorado Missionum: Argentinae collectis; leg; Ravenna 1951, XII-1971 (typus in Herb. Ravennae).

This handsome species is closely related to *A. striata* Lam., from which it mainly differs in its epiphytic habit and in the fact that the bulbs do not produce the characteristic bulblets. It is noted that, although belonging to a different ecological niche, this is an inhabitant of the same province as *A. petiolata* (see Ravenna 1970, pp. 73-78). The latter, an apparent natural hybrid, has still its parents not elucidated. Both *A. petiolata* and *A. arboricola* belong to the series *Striatae,* which means that they are allied. A chromosomical study in the latter is therefore needed.

Amaryllis guarapuavica Rav. sp. nov.

See PLANT LIFE 27:66, Fig. 20-B. 1971

A *Amaryllide vittata* affinis sed floribus longioribus decinatis, ab *A. ambigua* qui hybridum artificialem est perigonii diametro majore differt.

Plant 50-60 cm high. *Bulb* broadly ovoid about 8 cm in diam. covered with dark brown coats; pseudo-neck short. *Leaves* lorate, green, ascending, firm in texture, rather channelled, 25-42 cm long, 45-50 mm broad, almost obtuse. *Scapes* often two, 42-60 cm long, 16-30 mm broad. *Inflorescence* 2-4-flowered. *Spathe* valves subequal, marcescent, 9-10.8 mm long, 20-33 mm broad; inner bracts about 7, narrowly lanceolate, to linear. *Pedicels* 6-7 mm long. *Ovary* obtusely oblong, obtusely trigonous, a dark-green, 15-16 mm long, 5.5-8.3 mm broad. *Flower* very fragrant, about 18 cm. long, 11-12 cm in diameter; the *perigone-tube* brownish green in the lower half. *Tepals* oblanceolate, rather undulate, uncinate, white with two purple streaks on the adaxial face, about 12.7 cm long; the outer 30-31 mm broad, its apicule 4 mm long; inner 23 mm broad, acute. *Filaments* closely faccicled, white for most of the length, pink at the incurved apex; lateral episepal about 79 mm long, upper episepal 80-81 mm long, lower epipetal 83 mm long, lateral epipetal 91-93 mm long. Anthers reniform, 3-4 mm long. *Style* white, about 16 cm long (from the ovary). *Stigma* trifid, its lobes 3 mm long.

Hab.—In almost all open places with remnants of woody vegetation, in South-Western Paraná, Brazil. Also in the province of Misiones, Argentina.

Specimens: Prope Km 127 mun. Laranjeiras do Sul civitatis Paraná Brasiliae; leg. Ravenna 1038 cum G. Hatschbach 23129, 5-XII-1969 (typus in Herb. Ravennae, isotypus in Herb. Hatschbach). Mun. Guarapuava, Candoi; leg. Hatschbach 15184 (Herb. Rav., Herb. Hatschbach). Mun. Imbituva; leg. Hatschbach 7495, 23-X-1960 (Herb. Rav., Herb. Hatschb.). Argentina, prov. Misiones, Bonpland; leg. P. Joergensen Hanssen, 19-I-1930 (SI,BAB). Idem, floruit in Bonaria 24-XI-1901 in Horto Zoologico ex Misiones Santa Ana (?); leg. A. De Llamas (?), 1899 (SI).

In the 1971 edition of Plant Life (p. 66), I published *Amaryllis vittata* L' Her. ssp. *guarapuavae* Rav. Unfortunately, due to the omission in print of the specimens paragraph, this was illegitimate. At present, however, I feel convinced that the entity must be regarded as a species. The declined and larger flowers, are sharp features which separates *guarapuavica* from *vittata.* Both species are close allies, within subgenus *Macropodastrum.* *A. vittata* had hitherto been placed in subgenus *Lais.*

Amaryllis gertiana sp. nov.

A *Amaryllide petiolata* valde affinis sed bulbis ebulbilliferis folii ensiformibus acutioris tepalis angustioribus recedit.

Planta usque 37-46 cm alta. Bulbus subglobosus ad 50-58 mm latus. Folad anthesin 3-4 ensiformia acuta flaccida ad 17-30 cm longa circ 18-25 mm lata. Inflorescentia 3-flora. Flores rubri prope basin viridescentes ad 6-8.4 cm longi, circ. 4.5-7 cm lati. Perigonii tubus 10-19 mm longus. Tepala anguste oblanceolata recurvata ad 65-70 mm longa circ. 9-12 mm lata; tepalum interiori-inferius brevius et angustius. Filamenta ad apicem incurvata ad 32-47 mm longa. Antherae oblongo reniformes. Stylus usque 70-74 mm longus. Stigma trifidus lobis 3-4 mm longis.

Plant 37-46 cm high. *Bulb* subglobose 50-58 mm wide, produced into a 35 mm long pseudo-neck. *Leaves* 3-4 at anthesis, ensiform, acute, flaccid, a dark green (?), paler in the abaxial face, 17-30 cm long, 18-25 mm broad. *Scape* 26-44 cm long about 11 mm broad near the base, narrowing gradually toward the apex. *Spathe-valves* marcescent, subequal, about 43 mm long; inner bracts three, the outer 32 mm long, lanceolate, rather large, the other two shorter, linear-lanceolate. *Inflorescence* 3-flowered, *Pedicels* 13-21 mm long. *Ovary* obvoid or elliptic, obtusely trigonous, 4.5-6 mm long, 25 mm in transverse diameter. *Flowers* red, greenish toward the base, 6-8.4 cm long (when fully expanded), 4.5-7 cm in diameter. *Perigone* tube 10-19 mm long. *Tepals* narrowly oblanceolate, recurved, 65-70 mm long, 9-12 mm broad, except the lower inner which is shorter, narrower and prominent; outer series apiculate, apicules 1.4-1.5 mm long; *filaments* declined, incurved at the apex, the upper episepal 32-35 mm long, lateral episepal, 34-38 mm long, lower epipetal 36-38 mm long, lateral epipetal 45-47 mm long. *Anthers* oblong reniform, 4-4.7 mm long; pollen yellow. *Style* declined, curved, 70-74 mm long. *Stigma* trifid, its divisions spreading obliquely, 3-4 mm long.

Hab.—States of Paraná and Santa Catarina, Brazil.

Specimens: Brazil, Paraná, Municipe Bocaiuva do Sul, Santa Ana; leg. Hatschbach 27082, 4-X-1971 (type Herbarium Ravenna, isotype HH).

Similar to *Amaryllis petiolata,* but the bulb not bulbilliferous and the leaves gradually narrowed toward the apex. I have examined a specimen of this species from the State of Santa Catarina (HBR), but this is at present not with me.

The species is properly dedicated to Prof. Gert Hatschbach, the distinguished botanist of the State of Paraná, Brazil.

Amaryllis goiana Rav. sp. nov. (Fig. 19)

Ab *Amaryllide solandraeflora* proxima sed floribus multo minoribus (circ. 10.8 cm longis) erecto-patentibus tepalis anguste oblanceolatis differt.

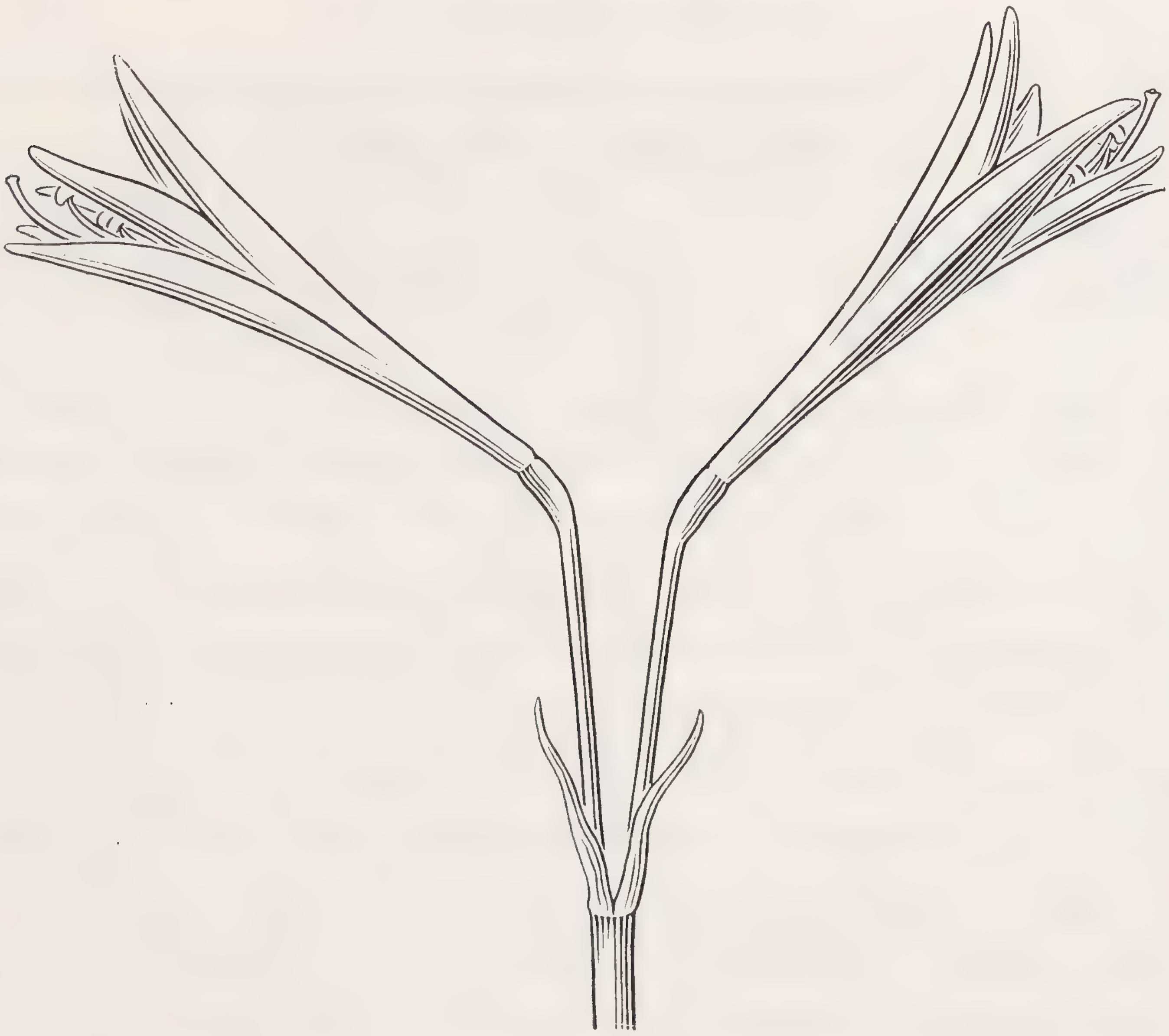

Fig. 19. **Amaryllis goiana** Ravenna, showing inflorescence (X 0.02) from living plant flowered in Buenos Aires. Drawing by Pierfelice Ravenna.

Plant 30-40 cm high (to the inflorescence apex). *Bulb* depressed-globose, ca. 6 cm in diameter; *pseudo-neck* short. *Leaves* hysteranthious, about 2-4, ascending, lorate, channelled or often almost flat above, a pale green, slightly pruinose, purplish below, with cartilaginous margins, sometimes with a pale, yellowish-green streak throughout at the middle, 40-70 cm long, 15-25 mm broad. *Scape* rather compressed, a pale green, ca. 18.5 cm long, 12 mm broad. *Spathe* two-flowered; valves lanceolate, marcescent, about 46 mm long, a greenish-ocher. *Pedicels* 37-73 mm long. *Flowers* obliquely ascending. *Ovary* pandurate-cylindrical, obtusely trigonous, green, rather striate with purplish-brown, 11-14.5 mm long, 4-4.4 mm broad. *Perigone* narrowly funnel-shaped a greenish-yellow, 10.8-15 cm long, 60-65 mm in diameter, with a few purple streaks below. Perigone-tube 35-54 mm long. *Tepals* narrowly oblanceolate, 75-90 mm long; the outer 10.5-17.5 mm broad, bearing a green, 1.5-2 mm long, apicule; the lateral-inner ca. 17.5 mm broad; lower-inner 12.4 mm broad. *Filaments* closely fascicled, whitish; the upper episepal 45-50 mm long, lateral episepal 52-54 mm long, lower epipetal 61-65 mm long, lateral epipetal 63-68 mm long. *Anthers* yellow, 5-5.8 mm long. *Style* declinate, 10.5-14.4 hh long. *Stigma* capitate, obscurely trilobed.

Hab.—In sandy lateritic soil near the city of Brasilia; also northwards as far as to the Chapada dos Veadeiros. In the latter region it grows in sandy quartzitic soil.

Specimens: Culta in Bonaria ex bulbis at Papuda pr. urbem Brasiliae collectis; leg. Ravenna 977, X-1968 (typus in Herb. Ravennae). Brazil, D.F., Papuda; leg. E. P. Heringer 8759, 5-IX-1961 (UB). Goiás, 200 km N of Brasilia, 800 m; leg. A. de Haas 170, 22-IX-1967 (U).

This species is closely related with *Amaryllis solandraeflora* Lindl. Bulbs and leaves are so similar in both, as to be undistinguishable. Notwithstanding, the much smaller, obliquely ascending flower, and the much narrower tepals, in *A. goiana*, are features which disagree with that species.

Amaryllis heuseriana (Karst.) Rav. comb. nov.

Hippeastrum heuserianum Karsten, Fl. Columb. 2(3): tab. 102. 1858-59.-*Amaryllis aulica* Ker var. *platypetala* Lindley, Edwards's Bot. Reg. 12: tab. 1038. 1827.-*Aulica platypetala* (Lindl.) Rafinesque, Fl. Tellur. 4: 10. 1836.

Hab.—An inhabitant of the States of Sao Paulo, Paraná and Santa Catarina, in Brazil. It often forms dense cespitose populations among rocks or along the sandy banks of some rivers.

Amaryllis aulica Ker var. *platypetala* had been not recognized as a species until Rafinesque (1836) proposed the new combination *Aulica platypetala.* Unfortunately, this epithet cannot be used because of the previous existence of *Amaryllis platypetala* Lindl. ex Bury (1831-34). The next available name is *Hippeastrum heuserianum* Karst., therefore the transference is made here.

Amaryllis heuseriana differs from *A. aulica* in its weak bulb covered by few, pale, membranous coats; the flaccid, bright green, narrowly oblanceolate leaves; and in the different size of tepals. *A. aulica* is an epiphytic, at least in nature, whereas *A. heuseriana* is terrestial.

The specimens already examined are, at present, not with me. They shall be published in due course along with the description and illustradition. Living plants were distributed among horticulturists of Curitiba (Brazil), Buenos Aires, Mendoza (Argentina), and other countries.

Amaryllis heuseriana (Karst.) Rav. forma **campanulata** Rav. f. nov

A forma *heuseriana* floribus campanulatis recedit.

It differs from the form *heuseriana,* in its bell-shaped flowers.

Hab.—Same places as the typical form.

Specimens: Culta in Bonaria ex bulbis ad ripas fluminis Tres Barras Munic. São Francisco do Sul civit. Santa Catarinae Brasiliae collectis; leg. Ravenna 1950, XI-1967 (typus in Herb. Ravenna).

Plants of this and the form *heuseriana,* growing together in nature, were selected and planted separately. After they flowered several times, the permanence of their distinctive features has been verified. The form *campanulata* has been pressed in several places of the State of Paraná by Prof. Hatschbach.

2. On the original location of **Amaryllis araripina**

In Plant Life 1970 (p.84), the description of *Amaryllis araripina* Rav., was published. In the reference to the epithet origin, it had been written: ''The name commemorates the Araripe indians, who were the original inhabitants where the plant grows.'' This information was obtained from native people.

Recently, however, I had the opportunity of consulting K. F. von Martius' Glossaria linguarum Brasiliensum or ''Glossarios de diversas língoas e dialectos que fallao os indios no imperio do Brazil'' (1863). In page 491 we found:

''ARARIPE, de arára e ypé, habitação ou lugar de aráras.'' This means: place of ''arara'' parrots. The town of Araripina has its origin in the near Chapada do Araripe (plateau of Araripe).

Amaryllis araripina also inhabits the State of Ceará; the following specimen proves it: Brazil, Ceará; leg. Fr. Allemão e Cisneiros 1530, I-1861 (R).

VII. STUDIES IN THE GENUS **GRIFFINIA**

1. A new tribe in order to accommodate the genus **Griffinia**

Griffinia was first placed by Herbert (1837) near *Lycoris* and *Brunsvigia.* In this he was followed by Bentham & Hooker f. (1885), and by Baker (1888). Traub & Moldenke (1949), include this genus in the tribe *Amaryllideae.* Recently, Traub (1963), transfers it to tribe *Eucharideae.*

Although filaments can be, very rarely, slightly connate at the base, the perigone shape disagrees with the members of the tribe *Urceolineae* (formerly *Eucharideae,* see p.). Actually, the flower shows much similarity, even in the bud stage, with some species of the genus *Crinum* (subgenus *Codocrinum*). Seeds of some *Griffinia* species, such as *G. ornata,* are often very large. Sometimes, the fruit has only two locules, and one of these is occupied by a single seed. Scape is tumbling and pedicels recurved in fructification.

From the above facts, it seems obvious that *Griffinia* has some affinity with the tribe *Crineae.* However, its habit and leaf morphology, including the lack of foliar mucilage (latex?), which in the members of the tribe *Crineae* turns into a kind of fibers when it dries, are reasons for excluding *Griffinia* from that tribe. A new tribe is therefore proposed.

GRIFFINIAE Rav. **tribus nova**

Plantae staturae mediocris vel pumilae. Folia semper petiolata; petiolus plus minusve longus; lamina saepe lata oblanceolata vel aellyptica. Scapus solidus marginatus compressus vel cylindraceus in fructificatio de cumbens. Inflorescentia multiflora rarius pauciflora. Valvae spathae membranaceae delicatae translucidae basin versus connatae vel liberae. Flores zygomorphi pedicellati vel subsessiles coeruleo-lilacei lilacei vel albi. Perigonii tubus brevis seu valde productus. Tepalum infero-interius a caeteris tepalorum distante. Stamina 4-seriata tota declinata seu sepalinum superius ascendente vel absente. Antherae parvae versatiles vel imperfecte versatiles. Ovarium ovula dua basalia collateralia seu usque sex superposita per loculum gerente. Stylus declinatus. Stigma punctatus vel minute capitatus. Pedicelli fructiferi quam floriferi haud robustiores deflexi vel recurvati. Fructus saepe durabilis deinde marcescens. Semina saepe magna ovata funiculum saepe conspicuum conduplicatum desiliente gerentia.

Plants of medium or small size. *Leaves* always petiolate; petiole variable in length; blade oblanceolate or elliptic. *Scape* solid, edged, compressed or cylindrical tumbling or inclinate with fructification. *Inflorescence* many or few-flowered. *Spathe-valves* membranous hyaline joined below or free to the base. *Flowers* zygamorphic pedicelled or subsessile, lilac-blue, lilac or white. *Perigone-tube* very short or long. Lower inner tepal distant from the other five. *Filaments* of four different lengths, all of them declined, or frequently the upper episepal ascending or suppressed. *Anthers* small, versatile or imperfectly versatile. *Ovary* with two, basal, collateral, ovules; rarely about six, superposed. *Style* declined. *Stigma* punctiform or pinutely capitate. *Pedicels* not stouter or elongating with fructification, deflexed or recurved. *Fruit* often long-lasting, marcescent. *Seeds* often large ovid or rounded with an almost flat side, with a large, not persistent, conduplicate funiculum.

Type: genus *Griffinia* Ker.

This tribe is an intermediate between the *Amaryllideae* and the *Crineae,* but closer to the latter. *Worsleya* seems to be the genus of the *Amaryllideae,* which connects the tribe to *Griffinieae.*

2. **Libonianae** series nova (subgeneris **Griffinia**)

A Series typica stamine episepalo superiori absente caeteris quinque declinatis differt.

It differs from the typical Series in the lack of the upper episepal stamen, the other five being declined.

Type-species: *Griffinia liboniana* Morren (Fig. 21, 22)

Traub & Moldenke (1949), p. 157, proposed the subgenus *Libonanthe,* upon the same species as above. Morel (1960), see also PLANT LIFE 17: 4. 1961, described *Griffinia rochae* (see Fig 20) a species from the vicinity of Río de Janeiro, which, as *G. liboniana,* bears only five stamens. In 1969, I reduced *Hyline* Herb. to subgenus of *Griffinia;* in the meantime I gave a key for distinguishing the subgenera. The characters employed were the six declined stamens, and the existence of several ("many", sphalm.), not more than six, ovules per locule. Sub-

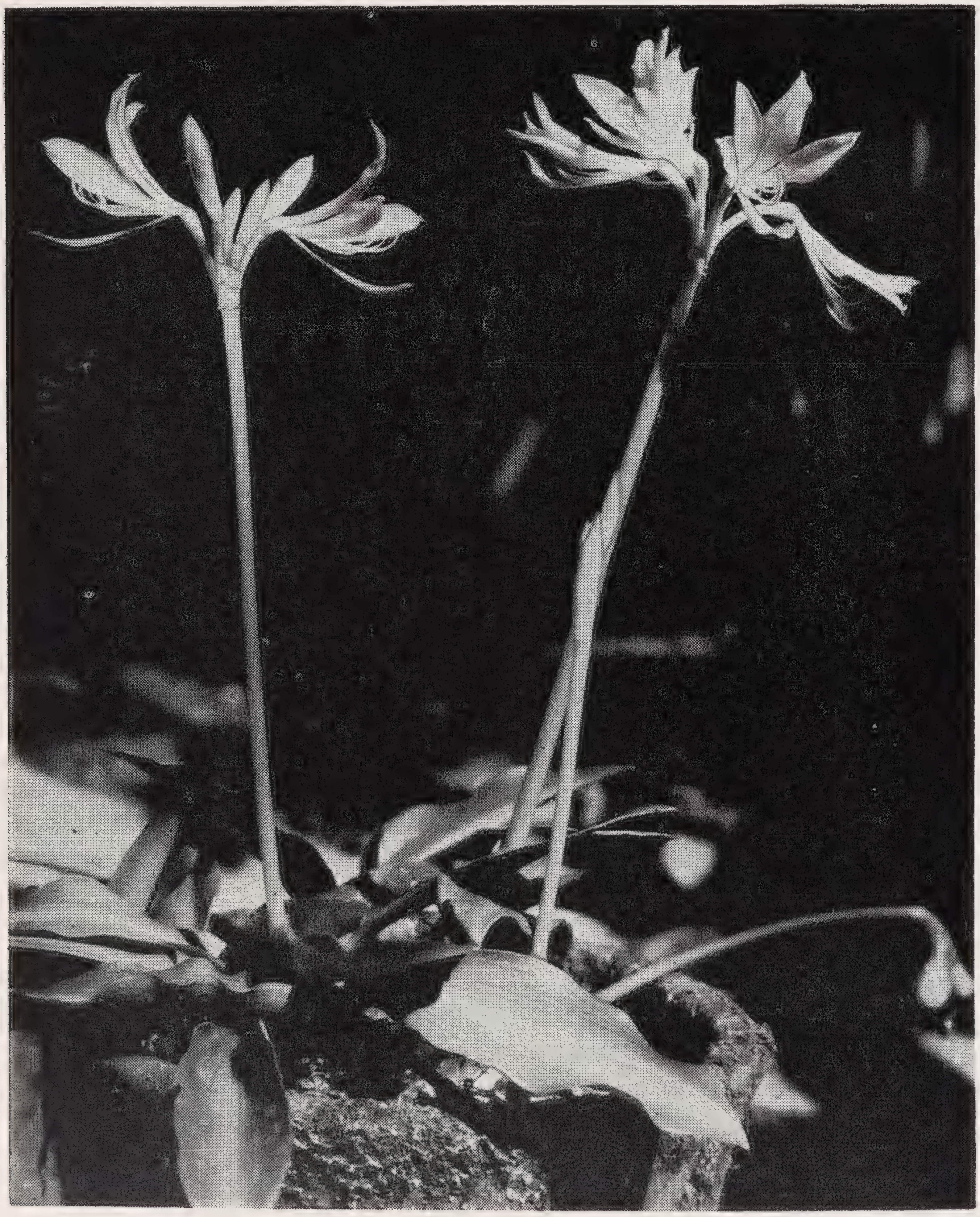

Fig. 20. **Griffinia rochae** Marel; as cultivated in Jardim Boânico de Rio de Janeiro. Photo by Pierfelice Ravenna.

genus *Libonanthe* was not considered, since it seemed to be a synonym of subgenus *Griffinia.*

3. Rediscovery of **Griffinia liboniana**

In 1969 I visited once more the Instituto Agronomico of Belo Horizonte, Minas Gerais (Brazil). In the occasion, Prof. Apparício P. Duarte, of that Institute, showed me some *Griffinia* plants, which were cultivated in a stove. The bulbs were gathered by Prof. Duarte at Cerca Grande, municipe of Pedro Leopoldo, Minas Gerais. Some fresh plants

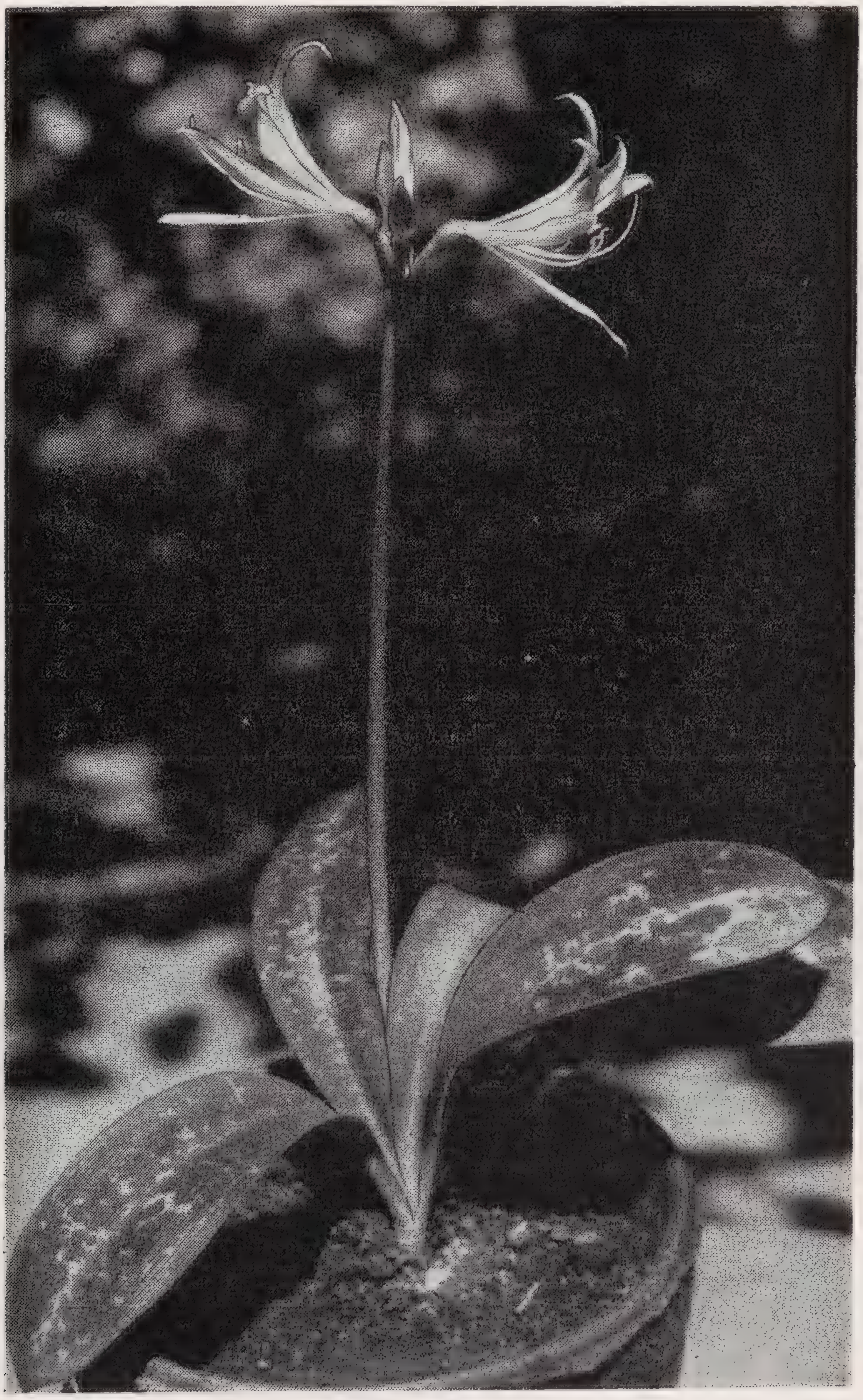

Fig. 21. **Griffinia liboniana** Lem., as cultivated by Pierfelice Ravenna at Buenos Aires. Photo by Pierfelice Ravenna.

were presented to me for study. The species proved lately to be *Griffinia liboniana* Morren.

Griffinia liboniana Morren (Figs. 21 and 22)

Morren, Ann. Soc. roy. Agr. Bot. Gand 1: tab. 13, 1845.—Lemaire, Jard. Fleur. 3. tab. 290. 1853.

Plant 15-25 cm high. *Leaves* broadly oblanceolate, petiolate, flaccid; petiole 20-45 mm long; blade 12-16 cm long, 35-55 mm broad, a dark green, almost marmorate with grayish-white. *Scape* 12-20 cm long, 3-6 mm broad, compressed, marginate. *Spathe* 1-valved or bivalved (?), shortly tubulose at the base, membranous, hyaline, about 18 mm long, bifid for 13 mm; inner bracts few. Inflorescence 4-7-flowered. *Pedicels* 6-12 mm long, green. *Ovary* elliptic, a bright green. *Perigone* lilac or a pale violet in the upper half, whitish below or sometimes greenish near the base, about 35 mm in its vertical diameter, and 28 mm in its horizontal diameter. *Perigone* tube 2mm long. *Tepals* oblanceolate-unguiculate; the upper outer channelled, ca. 31 mm long, 6 mm broad; lateral outer often greenish in the lower forth, then white, and bluish-lilac or lilac in the upper half, ca. 3 mm broad; inner tepals about 29 mm long, 6 mm broad, convolutely unguiculate for 10 mm; lower inner prominent, somewhat curved, whitish-lilac, ca. 26 mm longum, 3 mm

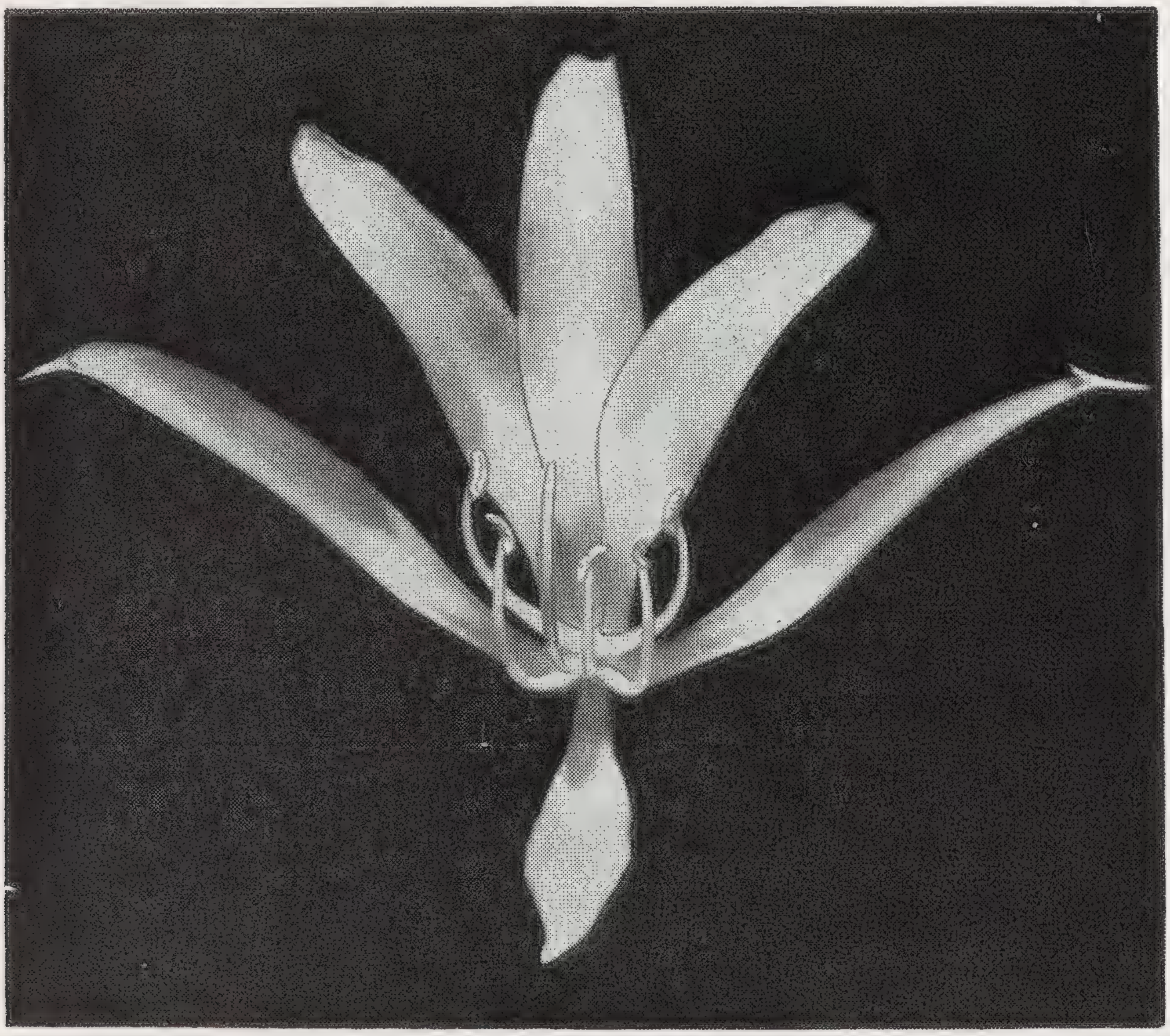

Fig. 22. **Griffinia liboniana** Lem., front view of flower. Photo by Pierfelice Ravenna.

broad. *Stamens* five, declinate, slightly diverging, the upper episepal suppressed; filaments white, the lateral episepal about 20 mm long; inner lateral 18 mm long; lower inner ca. 15 mm long. *Style* declined, filiform, about 28 mm long; *Stigma minutely* capitate-punctate.

Hab.—Under shade, in dark soil, near calcareous rocks, at Cerca Grande, municipe of Pedro Leopoldo, in the State of Minas Gerais, Brazil. Originally found by M. Libon at Serra de Lapa Vermelha (the now-called Serra do Cipó?), a few miles from Lagoa Santa, Minas Gerais.

Specimens: Culta in Horto Agronomico Belo-Horizontino (BHMG) ex bulbis ab A. P. Duarte in loco supra dicto collectis; leg. Ravenna 1016, XI-1969 (Herb. Rav.). Culta in Bonaria ex Horto Agronomico Belo-Horizontino; leg. Ravenna 1081, X-1970 (Herb. Rav.).

Lemaire (1853), describes the leaves of this species as ''absolument sessiles et non petiolées''. This was one of the two characters, which gave reason to Traub and Moldenke (1949) for erecting the subgenus *Libonanthe.* Although petioles could sometimes partially subterranean (as in *G. gardneri*), or closely clasping, leaves are distinctly petioled. Blades show, very often, grayish-white irregular spots. The writer removed the epidermis, in order to disclose the nature of these spots. They dissapeared in the process of detaching. Examination under microscope, of both epidermis and parenchyma, did not reveal any particular feature, except that the cell walls of the former are quite sinuose. Apparently, spots are produced by air or empty spaces beneath the epidermis. Anthers were described, by Lemaire, as ''non versatile''. Since the anthers in the fresh flowers studied by me were decidedly versatile, I think that Lemaire's observation could have been made before anther dehiscence.

The region where the plant was discovered, by M. Libon, is at present much modified by man. Possibly it has already disappeared from that place, as also apparently did *Griffinia concinna* (Mart. ex Schult.) Rav.

These plants grow well in the green-house, but decay soon if exposed outdoors. The species was distributed among horticulturists of Florida (U.S.A.) and Buenos Aires (Arg.).

4. Two new **Griffinia** species from Minas Gerais, Brazil

Griffinia aracensis Rav. sp. nov.

A *Griffinia parviflora* qui specie Bahiensis foliis angustioribus cinereo-maculatis differt. *G. liboniana* et rochae ad speciem nostram valde similes sed staminibus quinque habent.

Plant about 15 cm high or less. *Leaves* six, oblanceolate-petiolate, 7-18 cm long, 7.5-25 mm broad; petioles 5-9 cm long; blades a dark green, variously spotted with grayish white or grayish-green, acute. *Scape* 7.2-12 cm long. *Spathe* bivalved, membranous, hyaline, 4-7-flowered; valves often unequal broadly lanceolate, ventricose, 11-23 mm long, connate toward the base for 3-5 mm, abruptly narrowed upwards. *Pedicels* 10-17 mm long. *Perigone* horizontal, white in the lower half, lilac above, 13-25 mm long, 22-30 mm in diam. *Tepals* narrowly oblanceolate, 19-22 mm long, 2.5-2.8 mm broad, excepting the lower inner, which is narrower; the outer series distinctly apiculate; apicule ca. 0.8 mm long, puberulent on the inner half.

Griffinia itambensis Rav., sp. nov.

Species a *Griffinia aracensi* valde affinis sed foliis haud maculatis floribus saepe minoribus differt.

Planta 10-17 cm alta. Folia oblanceolata fusco-viridia haud maculata ad 12-25 mm longa circ. 15-22 mm lata. Scapus usque 9-19 mm longus. Ovarium veride vel viridescente. Perigonium cernuus 13-16 mm longum circ. 13-15 mm latum. Tepala anguste oblanceolata ad apicem recurvata inferne alba suprene lilacea. Filamenta sex, sepalinum superius ascendente usque 10-11 mm longum, caetera declinata 7.5-11 mm longa. Stylus declinatus filiformis ad 16-17 mm longus. Capsula irregulariter blobosa vel late obvata ad 9.5-13 mm longa. Semina ovato-oblonga ad 6-6.5 mm longa.

Plant 10-17 cm high. *Bulb* subglobose, about 25-30 mm in diameter, the pseudo-neck almost obsolete. *Leaves* petiolate, the blade lanceolate or oblanceolate, spreading, dark green, not speckled, to 12-25 cm long, 15-22 mm broad, distinctly sheathed below, acute. *Stem* erect weak, 9-19 cm long. *Spathe* bivalved, membranous, thin and breakable, apparently whitish; valves ventricose, joined and tubular below, about 10 mm long. Inflorescence 7-11-flowered. *Pedicels* 13-19 mm long, fruiting somewhat stouter. *Ovary* oblong-elliptical, apparently green or greenish, 2.5-3 mm long, 1.5-1.8 mm broad. *Perigone* cernuous, 13-16 mm long, 13-15 mm in diam. *Tepals* oblanceolate, white below, lilac and recurved toward the apex, about 14-16 mm long, 2-2.6 mm broad; the outer series with a 0.8 mm long apicule. *Filaments* six; the upper episepal ascending, 10-11 mm long, the rest declined: lateral episepal 7.5-8 mm long, lateral epipetal 8.5-9 mm long, lower epipetal 10-11 mm long. *Anthers* versatile, sightly twisted, 1-1.5 mm long; pollen dirty yellow. *Style* declined, filiform, 16-17 mm long. *Stigma* punctate. *Capsule* irregularly globose or widely obovoid, about 9.5-13 mm long. *Seeds* oblong-ovoid, one or two in each locule, 6-6.5 mm long.

Habitat.—Hill-sides with second growth forest and bracken-covered "campo", sloping down to river with blocky sandstone and sandy soil at sonth-eastern drainage of Pico de Itambé, municipe of Itambé, State of Minas Gerais, Brazil. It grows in wet sand on shaded river banks (according to the collectors); altitude: 950 m.

Specimens: Brazil, Minas Gerais, mun. Itambé, about 5 km directly west and north of Santo Antonio do Itambé, south-eastern drainage of Pico de Itambé; leg. W. R. Anderson et al., 9-II-1972 (typus Herb. Ravennae, isotype NY).

Allied to *Griffinia aracensis,* but the leaves not spotted and the flowers smaller.

VIII. A NEW NAME TO TRIBE **EUCHARIDEAE**

Since the type of the tribe Eucharideae was reduced to synonymy of *Urceolina* (see Traub 1971), the tribe name must be changed accordingly:

Tribe URCEOLINEAE nom. nov.—Syn.: subtribe Eucharidinae Pax, Engl. & Prantl Natur. Pflanzenfam. ed. I, 2 (5) : 110. 1887.—Tribe Eucharideae (Pax) Traub, Gen. Amaryll.: 73. 1963 (as Euchareae).—Type: genus *Urceolina* Reichenbach (nom. cons.)

IX. GENUS **CASTELLANOA** REDUCED TO SYNONYMY OF **CHLIDANTHUS**

In 1967 (see Sellowia 19, p. 34) I recorded the genus *Castellanoa* in Bolivia for the first time. This report was based on a dry specimen collected by Dr. Cárdenas at San José, Province of Quechisla, which had been compared with an isotype (BAF). At that time is was stated that *Castellanoa* is ''A monotypic genus placed not far from *Chlidanthus* and from *Stenomesson* (subgen. *Clinanthus*)''. A key for the purpose of separating *Castellanoa* from *Chlidanthus* has been published (Ravenna 1969, p. 56). The only apparently firm characters to distinguish them lay in the slightly zygomorphic, cernuous to pendulous, red flowers of *Castellanoa* as to the actinomorphic, upright, yellow flowers of *Chlidanthus.*

Recently, Traub (1970, p. 63) publishes *Chlidanthus cardenasii,* as a new species from Bolivia; he describes its flowers as horizontal and quite similar in shape to those of *Castellanoa marginata* (Fries) Tr. The color of the former is green with pink streaks and the apex of tepals purple lilac. Ravenna (1971, pp. 72-73) gave description of a new *Castellanoa, C. yaviensis* Rav. In this species the perigone resembles that of *C. marginata,* but the androceium shows substantial differences: filaments are toothed and connected at the base by a membrane; the first character causes the filaments to resemble those in *Eustephia.*

Herbert (Amaryll., p. 191) states that *Chlidanthus* '' . . . was represented and described by Professor Lindley, who discovered a slight membranous connection at the base of the filaments, and irregular half-abortive dentate wings to the shorter or sepaline filaments, which I did not perceive in the specimen on which I founded the genus . . . ''. Furthermore, Herbert says: ''I find a fine six toothed membrane, in which the filaments are inserted, adhering to the tube and lower part of the petals, the petaline teeth being prolonged. This membrane while the flower is fresh is partible, separating from the perianth like acuminate wings to the decurrent filaments, by taking hold of the point of the filament and pulling it. Those points are very short and ultimately curved''. Baker (1888) defines the filaments of *Chlidanthus* as ''short, subulate from a deltoid base'', in apparent contradiction to Herbert's remarks.

A specimen of *Chlidanthus fragrans,* which I found in the Museum of Santiago (SGO 24363), proves that both Herbert and Baker were right in their observations. In fact, although filaments are mostly simple, some of them show irregular lobes near the base; obviously this is a variable condition. Moreover they are definitely connected by a membrane at the base.

The information of above shows that there is no effective feature for distinguishing *Castellanoa* from *Chlidanthus.* The former genus is therefore a synonym of the latter.

CHLIDANTHUS Herb.

Herbert, Append.: 46. 1821.—*Sanmartina* Traub, Pl. Life 7: 41. 1951; not *Sanmartinia* Buch. (1949).—*Castellanoa* Traub, loc. cit. 9: 63. 1953.

Flowers trumpet-shaped, actinomorphic or very slightly zygomorphic, upright, ascending, horizontal, or sometimes declined, yellow, red, orange-red, or green striped with pink and tinged purple. *Perigone-tube* well developed. *Tepals* much shorter than the perigone-tube, lanceolate, often moderately spreading. *Filaments* variable in ength but not exceeding the perigone, flattened and winged below, sometimes with a pair of teeth in the upper part of the wings, often connected at the base by a thin membrane which is adnate to the tube. *Anthers* versatile or almost straight, dorsifixed, yellow. *Style* filiform, straight, surpassing or not the perigone. *Stigma* trifid. *Capsule* globose-tricoccus. *Seeds* flat, a dark brown, often winged or with membranous edges.—Bulbous plants. *Bulb* ovoid often large, produced into a pseudo-neck. *Leaves* linear, chanelled, a grayish green, often pruinose, obtuse or subacute, with minutely papilose scabrous margins. *Scape* solid, compressed, margined. *Spathe* bivalved; valves marcescent, free to the base. *Inflorescence* 2-several-flowered. *Pedicels* very short or well developed.

Type-species: *Chlidanthus fragrans* Herb.

DISTRIBUTION OF THE GENUS.—Recently I have been asked about the presence of *Chlidanthus fragrans* in Chile. Herbert (1837, p. 192), gave the first report on this matter. In a discussion of the possible origin of plants which were at that time being cultivated in England and that were thought to have come from Argentina or Chile, he said the following: ''Mr. Brookes's bulbs were said to have come from Chile, but I have some reason for doubting the fact. Bulbs of Chlid. fragrans were sent to my brother from Buenos Aires, about the same time, I believe at the same time precisely; but it may have been an inhabitant of gardens there . . .''. Kunth (1850, p. 653), on the basis of this ambiguous information, reported *Ch. fragrans* in Chile and Buenos Aires. This distribution was accepted by Gay (1855, p. 74-76), F. Philippi (1881), Bentham & Hooker f. (1880, p. 723), and others. Baker (1888) refers to a specimen from Argentina (Catamarca, Lorentz!) as *Chlidanthus fragrans.* This specimen might be identified with the type-sheet of *Hieronymiella chlidanthoides* Pax. Kuntze (1898) records *Ch. fragrans* from Paso Cruz (also known as Paso de la Cruz de Piedra), Mendoza, but this probably is a misidentification of some dry specimen. The only one Amaryllid that can be found so high in the Andes of Mendoza is *Famatina herbertiana.* No true *Chlidanthus* species, belonging to this genus, has been recorded in the flora of Argentina; therefore, the species previously known as *Castellanoa* represent the only real entities of that genus which occurs in Argentina.

As can be seen, the record of *Chlidanthus fragrans* in Argentina and Chile can not be confirmed by data. In my opinion, the species is native exclusively to South Peru.

The range of *Chlidanthus* extends from the porthern plateau of Argentina through Bolivia to Peru.

1a. Flowers upright or nearly so:
  2a. Pedicels obsolete or very short .... 1. **Ch. fragrans**
  2b. Pedicels well developed, 17-21 mm long:
    3a. Perigone tube about 75 mm long .... 3. **Ch. soratensis**
    3b. Perigone tube about 67 mm long .... 3, **Ch. boliviensis**
1b. Flowers horizontal to declined:
  4a. Flowers red, sometimes with yellow stripes, or orange-pink:
    5a. Filaments toothed at the apex of the winged portion, connected at the very base by a thin membrane .... 4. **Ch. yaviensis**
    5b. Filaments not toothed nor connate at the base .... 5. **Ch. marginatus**
  4b. Flowers green with pink streaks; the apex of tepals tinged purple lilac 6. **Ch. cardenasii**

Notes.—The reader should observe the slight difference which separates *Ch. boliviensis* from *Ch. soratensis*, which suggests an identity of species; but, due to the lack of evidences, the former is tentatively accepted.—*Ch. ehrenbergii* (Klotzsch) Kunth (*Coleophyllum ehrenbergii* Klotzsch, is apparently a further synonym for *Ch. fragrans;* the geographic area of the former, Mexico, is probably wrong, since its description was seemingly based upon cultivated plants.— *Hippeastrum marginatum* Fries and *Castellanoa yaviensis* Rav. are transferred to *Chlidanthus.*

Chlidanthus marginatus (Fries) Rav. comb. nov.

Hippeastrum marginatum Fries, Nov. Act. Reg. Soc. Scient. Upsal. Ser. IV, 1(1): 161. 1905.—*Amaryllis marginata* (Fries) Traub et Uphof, Herbertia 5: 12. 1938.—*Sanmartina marginata* (Fries) Traub, Pl. Life 7: 41. 1951.—*Castellanoa martinata* (Fries) Traub, Pl. Life 9: 63. 1953.

Specimens: Argentina, province of Jujuy, Santa Catalina, El Angosto; leg. Fritz Claren, 1-II-1901, Herb. Kurtz 11559 (isotype BAF). Bolivia, Quechisla, San José; leg. Martin Cárdenas 99, I-1932 (SI).

The original illustration of *Hippeastrum marginatum* Fries (basonym of *Chlidanthus marginatus*), shows the filaments inserted at the same level. This detail is incorrect. A dissection in the isotype (BAF), reveals that the episepal filaments are placed somewhat below the epipetal series.

Chlidanthus yaviensis (Rav.) comb. nov.

Castellanoa yaviensis Ravenna, Pl. Life 27: 72. 1971.

Specimens: Argentina, Jujuy, dept. of Yaví, downward ravine from Yaví, to Bolivia, 3380 m of altitude; leg. D. Werner 877, 25-X-1967 (type LP, isotype Herb. Rav.).

X. STUDIES IN THE GENUS **STENOMESSON**

New species and transferences are proposed. Moreover the genus *Clitanthes* Herb. is recognized under subgeneric rank; and further notes on *Stenomesson flavum* (Ruiz et Pav.) Herb. and its synonymy, are included. In addition, the illustration of *S. campodense* Rav. (1971) is given.

On the presence of **Stenomesson** in Chile, and recognition of **Clitanthes** Herb. under subgenus rank.

During explorations in North Chile, a new species of *Stenomesson* was found. This is closely related with *Stenomesson humile* (Herb,) Bak. In order to accommodate both species, the genus *Clitanthes* Herb. (1839) is revalidated in the subgenus level.

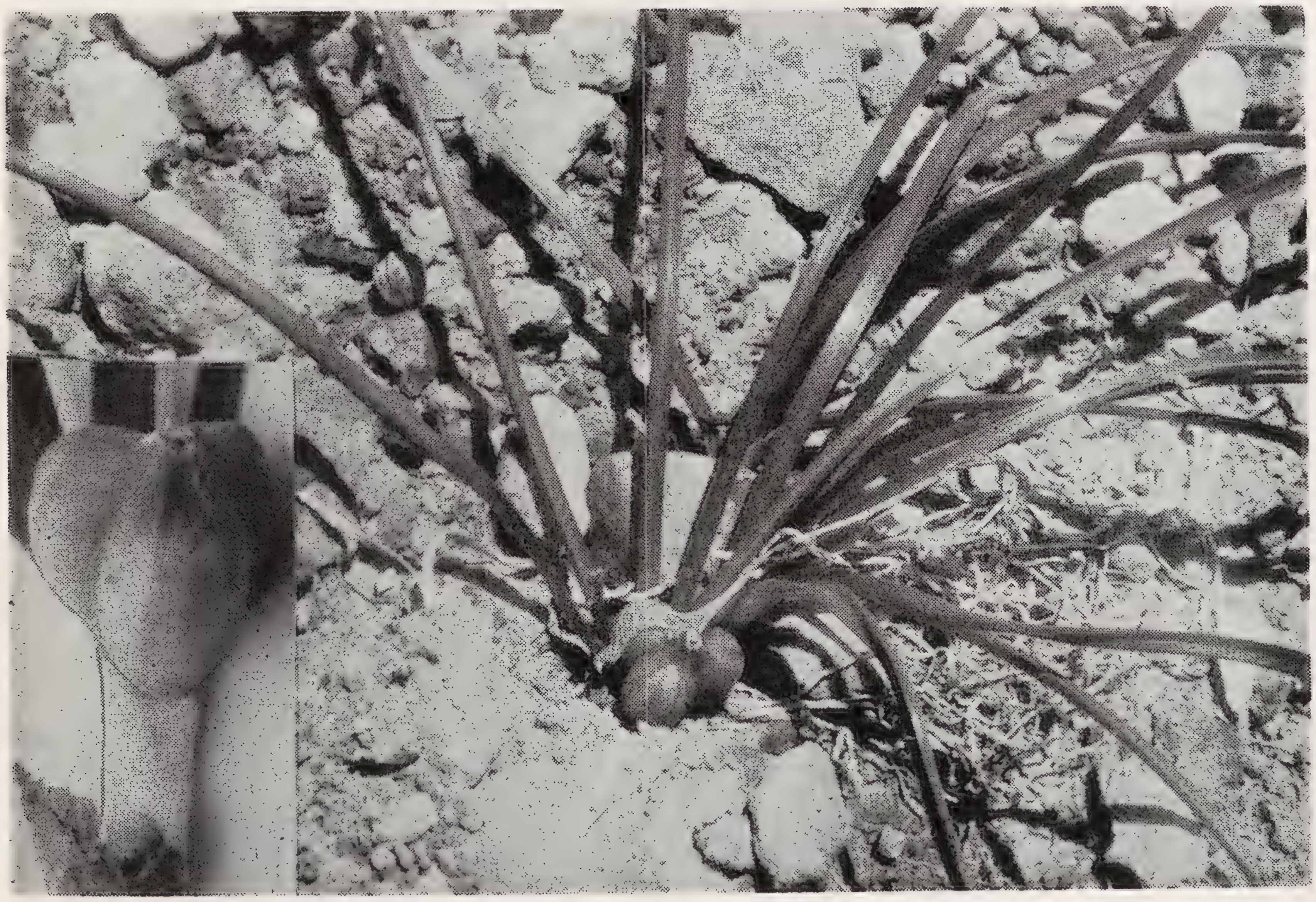

Fig. 23. **Stenomesson chilense** Ravenna. **Right Stenomesson chilense** Ravenna, in fruit, in its wild state. **Left,** close-up of capsule and upper part of pseudo-neck. Photos by Pierfelice Ravenna.

CLITANTHES (Herb.) stat. nov. (**Stenomessii** subgenus)

Genus *Clitanthes* Herbert, Edwards' Bot. Reg. Misc. 87. 1839.

Scapus subterraneus in pseudocollo bulbi inclusus; ovarium subterraneus; fructus supra solum situs.

Scape subterranean hidden in the pseudo-neck; ovary subterranean; fruit placed above the soil level. Type species: *Stenomesson humile* (Herb.) Bak. (*Clitanthes humilis* Herb.).

Baker (1888), placed *Stenomesson humile* in subgenus *Stenomesson*, but the plant shows, in my opinion, enough distinctness to be placed in another group. The related species which follows, gives strength to this position.

Stenomesson chilense Rav. **sp. nov.** (subgen. **Clitanthes**) (**Fig. 23**)

A *Stenomesso humili* foliis flaccidis canaliculatis haud crassiusculis differt.

Planta circ. 4-6 cm alta. Bulbus ovatus ad 35-45 cm longus circ. 23-30 latus. Folia linearia canaliculata flaccida fusco-viridia haud pruinosa prostrata circ. 2-2.5 mm lata. Scapus subterraneus. Perigonium cernuus usque 44-58 mm longus; tubus leviter curvatus 30-45 mm longus. Filamenta biseriata inferne circ, 3 mm concrescentia edentata ad partem libera lineárisubulata. Stylus perigonium valde excedens. Capsula globoso-subtricocca circ. 17-22 mm lata. Semina cum testa excurrenti subcircularia brunneo-ochracea.

Plant 4-6 cm high. *Bulb* ovoid 35-45 mm long, 23-30 mm in diam. covered with few, a pale brown or grayish-brown coats; pseudo-neck 5-7 cm long. *Leaves* synanthious (?), prostrate, linear, channelled, a dark green, not pruinose, 10-15 (-20) cm long, 23-30 mm broad. *Scape* subterranean, growing a little in fructification in order to permit the development of the fruit just above the soil level. *Perigone* cernuous, 44-58 mm long. *Perigone-tube* rather curved, 30-45 mm long, 3-4 mm broad at the apex. *Tepals* narrowly oblanceolate, 20-28 mm long, 2-5 mm broad in the upper third. *Filaments* biseriate, joined below in a 3 mm long, not toothed, *staminal cup;* free part linear-subulate; the episepal about 8.5 mm long, the epipetal ca. 9.5 mm long. *Anthers* oblong-reniform, 3.8-4.4 mm long. *Style* much exceeding the perigone. *Stigma* capitate-trilobed. *Capsule* globose, subtricoccous, 17-22 mm in diam., often conserving the dry remnant of the perigone. *Seeds* brownish-black, the testa being excurrent, resulting in a semilunar brownish-yellow wing; hence the outline is circular, 6.5-8 mm in diam.

Hab.—Gentle rocky slopes, 3200 m above the sea, 4 Km west from Zapahuira, in the province of Tarapacá, Chile. It grows near *Mastigostyla cyrtophylla* Johnst. (*Iridaceae,* inedit record in the Chilean flora), *Portulaca* sp., *Plantago* sp., *Myosotis* sp., *Calandrinia* sp. (2 species), and other short-living herbs; several small bushes and cacti were also inhabiting the same place.

Specimens: In decliviis petrosis 4 km ad occidentem Zapahuirae provinciae Tarapacá Chiliae; leg. Ravenna 1310, III-1971 (typus in Herbario Ravennae).

The present species represents the first genuine record of the genus in the Chilean flora. *Stenomesson recurvatum* was previously quoted in this country (see Baker 1888), but this is, in my opinion, a mistake. The latter inhabits the region of Canta and Obrajillo, in the Lima dept., Peru. Herbert (1837, p. 198), cites *Coburgia discolor,* which apparently is a synonym of *S. recurvatum,* as "found on mountains of Chile and in 17° 39′ South lat. which must be in La Paz of Peru". Obviously, Herbert's vague knowledge concerning the boundry between Chile and Peru, caused these confusions.

Although already withered when plants were found, some flowers served for description. Bulbs and seeds were distributed for cultivation.

Stenomesson caracense Rav. **sp. nov.** (subgen. **Stenomesson**)

Species a *Stenomesso glareoso* proxima sed pocula staminali breviora et latiora.

Plant 8-8.5 cm high. *Bulb* not seen. *Scape* about 45 mm long, 2.5 mm broad. *Spathe* membranous greenish-white; valves lanceolate, free to the base, subequal ca. 20 mm long. *Pedicels* 6-8 mm long. *Ovary* ellipsoid, obtusely trigonous, about 4.5 mm long, 1.8 mm broad. *Perigone* green, about 44 mm long. Perigone tube 31 mm long, constricted at the middle, 1-1.2 mm broad below the constriction, 4-4.2 mm above. *Tepals* obliquely spreading, lanceolate, about 13.2 mm long; the outer 3.1-3.5 mm broad, the inner 3.5 mm broad, subacute. Staminal cup short. *Filaments* 6.5-7 mm long. *Anthers* elliptical, 3.1 mm long. *Style* scarcely surpassing the perigone.

Specimens: Perú, dept. of Ancash, Caráz, E of Pueblo Libre, 3000 m; leg. W. Colaris 1340, 28-VII-1969 (type U).

Closely related with *Stenomesson blareosum* Rav. (1971), but differing in the shorter, wider, staminal cup. The new species was recognized among a large number of specimens received from the Utrecht Museum for identification.

Stenomesson callacallense Rav. **sp. nov.** (subgen. **Stenomesson**)

A *Stenomesso flammido* foliis lanceolatis in prefoliatioi cum marginibus revolutis dentibus paraperigonii integris, a *S. caracense* colore floris, a *S. flavo* forma perigonii et magnitudine paraperigonii differt.

Plant about 55 cm high *Bulb ovoid*, 45-50 mm long, 37-40 mm wide, covered with dark brown coats and produced into a 40-45 mm long pseudo-neck. *Leaves* absent or incipient at anthesis, lanceolate, with revolute margins in prefoliation. *Scape* 48-50 cm long. *Inflorescence* 3-5-flowered. *Pedicels* 13-18 mm long. *Flowers* cernous to decined (?), orange, about 64 mm long. *Perigone-tube* slightly curved, 40-42 mm long, 5-6 mm wide at the apex, narrowing gradually toward the base. *Tepals* broadly lanceolate, erecto-patent, about 18 mm long, the outer series 8mm broad, apiculate, the inner acute 7.8 mm broad; apiculum 1.8 mm long, with the thickened velutinous base. *Staminal* cup short, 3 mm long (to the insertion of stamens), toothed; teeth six, placed between the filaments, entire, oval-oblong, 1.6-2 mm long. *Filaments* filiform, the episepal series 6.5-7 mm long, epipetal about 8 mm long. *Anthers* versatile, yellow, 6.5-7.2 mm long before dehiscence. *Style* reaching the length of the perigone, about 6.4 mm long. *Stigma* capitate, obscurely trilobed. Immature capsule globose-tricoccous, almost rostrate, 16-17 mm in diameter.

Hab.—On rocky slopes between Leimebamba and Balsas, near the place called Jalca de Calla-Calla, 2800 m over the sea, in the dept. of Amazonas (province Chachapoyas), Peru.

Specimens: Peru, Dept. of Amazonas, Province of Chachapoyas, Jalca de Calla-Calla (Leimebamba-Balsas); leg. A. Sagástegui, 23-X-1965 (type HUT 6054).

This species is easily separable from all the known species of North Peru. *S. aurantiacum* and *S. flavum,* are the only species with orange flowers from that region. The former has a shorter flower and no teeth between the filaments; the latter, a native of the costal elevations, has a shorter perigone and a larger staminal cup. *S. flammidum,* which is found not far from the present species, has linear leaves, intensely red flowers, and bifid teeth between the filaments. *Stenomesson callacallense* is a pretty plant and merits cultivation.

FULGITUBA, Stenomessii subgen. nov.

A subgeneribus *Stenomesso* et *Clitanthe* habitu robusto et scapo ancipiti a subgenero *Callithauma* filaments in margine paraperigonii inserta differt.

Distinguishable from the subgenera *Stenomesson* and *Clitanthes* on account of its robust habit and the compressed, margined scape; it differs from subgenus *Callithauma* in the filaments attached at the margin of the paraperigone.

Type-species: *Stenomesson incarnatum* (H.B.K.) Bak. (*Pancratium incarnatum* H.B.K.).

Species at present recognized: *Stenomesson incarnatum* (H.B.K.) Bak., *S. variegatum* (Ruiz et Pav.) Macbr., *S. fulvum* (Herb.) Rav., *S. imasumacc* Vargas, and *S. luteoviride* Bak. (?).

A tentative key of the species in this subgenus has been postponed due to the present impossibility of separating *S. imasumacc* from *S. variegatum.* If the illustration of *S. recurvatum* in Ruiz & Pavón ''Flora Peruviana et Chilensis'' is correct, its flower shape should bar its future placement in this subgenus. The same case if found in *S. discolor* (Herb.) Bak., a probable synonym of *S. recurvatum.*

Stenomesson campodense Rav. (Fig. 24)

Ravenna, Pl. Life 27: 75. 1971.

Stenomesson campodense Rav. had been originally described without a figure; this is provided here.

LITERATURE CITED

Baker, J.G. 1878; Trimen **Journ. Bot.** 16: 83.
—— 1888; Handbook of the Amaryllideae, 216 pp., London.
—— 1898; **Bull. Misc. Inf. Kew:** 226.
Bentham, G. and J. D. Hooker f., Genera Plantarum 3: 711-740.
Cárdenas, M. 1971, Bolivian Amaryllids, 1970; **Pl. Life** 27: 36-43.

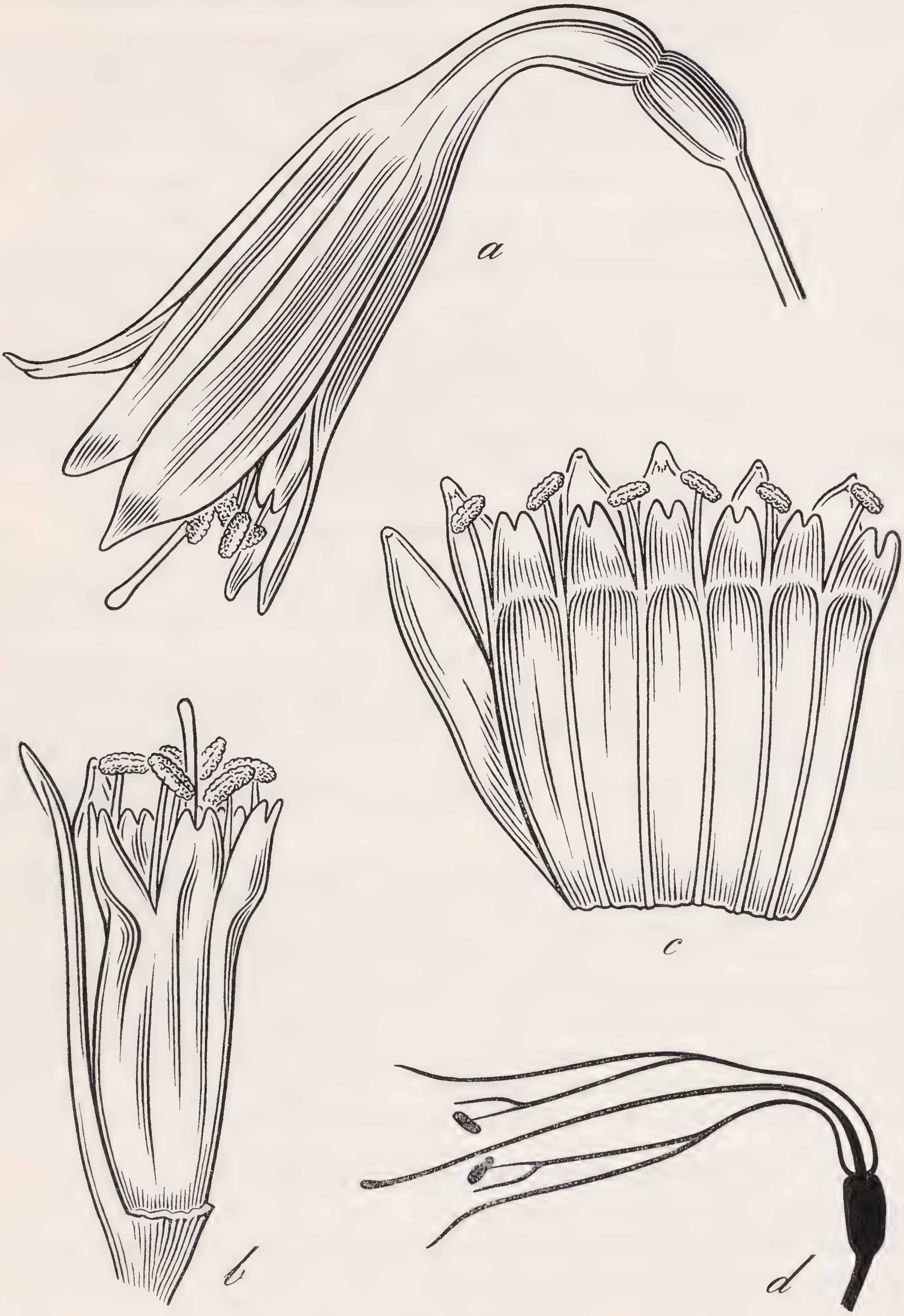

Fig. 24. **Stenomesson campodense** Ravenna. **a** flower (X2.1); **b** flower with some tepals removed, showing staminal cup (X 2.1); **c,** staminal cup opened, inside view (X 1.9); **d,** scheme of a longitudinal cut of flower. Photo by Pierfelice Ravenna.

Cabrera, A. L. 1953; Manual de la flora de los alrededores de Buenos Aires: 145-148.

Chodat et Lendner, 1901, **Bull. Herb. Boiss.** ser. II, 1: 422.

Fabris, H.A. 1969; **Amaryllidaceae;** Cabr. Flora prov. Buenos Aires 1: 520-535.

Gay, C. 1855, Historia Física y Política de Chile, Botánica 6: 65-98.

Grisebach, A. 1879, Symbolae ad floram Argentinam; **Abhandl. Koenigl. Gesellsch. Wissench. Goettingen,** 19, 345 pp.

Herbert, W. 1821, An appendix (to the Botanical Register.) 52 pp., 4 pl., London.

—— 1837, Amaryllidaceae, 428 pp., London.

Holmberg, E.L. 1903, Amaryllidáceas argentinas indígenas y exóticas cultivadas; **An. Mus. Hist. Nat.** Buenos Aires 12: 75-191.

Hunziker, A.T. 1967, Estudios sobre **Amaryllidaceae** II. Notas taxonómicas sobre los géneros **Hieronymiella, Hippeastrum** y **Habranthus; Kurtziana** 4: 7-18.

—— 1969, Estudios sobre **Amaryllidaceae** III. Sinopsis provisional de **Hieronymiella,** y novedades argentinas sobre **Zephyranthes;** loc. cit. 5: 343-367.

—— 1971, Estudios sobre **Amaryllidaceae** IV. Ampliación del área de 3 especies sudamericanas; **loc. cit.** 6: 261-263.

Johow, F., 1948, Flora de las plantas vasculares de Zapallar; **Rev. Chil. Hist. Nat.** 566 pp.

Kunth, C. S. 1850, Enumeratio Plantarum 5: 467-850.

Kuntze, O. 1893, Revisio Genera Plantarum 3: 309-311.

Lemaire, Ch. 1853, **Jard. Fleur.** 3: tab. 290.

Lindley, J., 1835, **Pyrolirion aureum;** Edwards **Bot. Reg.** tab. 1724.

Moldenke, H.N. 1963, Amaryllid genera and species; **Pl. Life** 19: 55.

Morel, G.M. 1960, **Griffinia rochae** sp. nov.; **Baileya** 8(4): 133-136.

Pax, F. 1890, Beiträge zur Kenntnis der **Amaryllidaceae;** Engler **Bot. Jahrb.** 11: 318-337, figs. 1-14.

Philippi, F. 1881, Catalogus Plantarum vascularium Chilensium; **An. Univ.** Chile 59, I-VIII, 377 pp.

—— 1896, in R. Philippi, Plantas nuevas chilenas; **loc. cit.** 93: 144-45.

Philippi, R.A. 1873, Descripción de plantas nuevas chilenas. . .; **An. Univ.** Chile 43: 479-583.

Rafinesque-Schmaltz, C.S. 1836, Flora Telluriana, 96 pp.

Ravenna, P.F. 1967, Contribuicões ao estudo das **Amaryllidaceae** da América do Sul I; **Sellowia** 19: 25-36.

—— 1969, Contributions to South American **Amaryllidaceae** II; **Pl. Life** 25: 55-76.

—— 1970, Contributions to South American **Amaryllidaceae** III; **Pl. Life.** 26: 73-103.

—— 1971, Contributions to South American **Amaryllidaceae** IV; **Pl. Life** 27: 61-89.

—— 1972, **Famatina** gen. nov., **Amaryllidaceae; Pl. Life** 28: 55-72.

Sealy, R., 1937, **Zephyranthes, Pyrolirion, Habranthus** and **Hippeastrum; Journ. Roy. Hort. Soc.** 62: 195-209.

Spegazzini, C. 1917, Ramillete de plantas argentinas nuevas o interesantes; **Physis** 3: 37-47.

Traub, H.P. 1956, **Rhodophiala modesta.** Pl. Life, 12: 73-74.

—— 1961, **Griffinia rochae.** Pl. Life. 17: 4.

—— 1963, The genera of **Amaryllidaceae,** 85 pp., La Jolla (Cal.), U.S.A.

—— 1970, **Chlidanthus cardenasii** sp. nov.; **Pl. Life** 26: 63-65.

—— 1971, Amaryllid notes 1971; **Pl. Life** 27: 57-59.

—— 1972, Amaryllid notes 1972; **Pl. Life** 28: 66-67.

—— and H. Moldenke 1949, **Amaryllidaceae,** tribe **Amarylleae,** 194 pp, ill., Standford (California).

PLANT LIFE LIBRARY—continued from page 14.

HERB MAGIC AND GARDEN CRAFT, by Louise Evans Doole. Sterling Publ. Co., 419 Park Av. So., New York, N.Y. 10016. **1973.** Pp. 192. Illus. Trade Ed. $3.95. Part I of this interesting book is concerned with the growing of herbs—basic herbs, descriptive list of herbs, outdoor herb garden, propagation of herbs, harvesting, storing, and the indoor herb garden. Part II is devoted to the use of herbs and Part III. is concerned with garden crafting. Recommended to all interested in herbs.

HOUSE PLANTS FOR THE PURPLE THUMB, by Maggie Baylis. 101 Productions, 834 Mission St., San Francisco, Calif. 94103. **1973.** Pp. 192. Illus. Paperback, $3.95; hard cover $7.95. Humorously written and profusely illustrated with 220 line drawings, this book gives directions for the care of over 200 common and exotic indoor plants. There are also sections on terrarariums, unusual containers, dry bouquets, cut flowers, moving and vacation care, buying plants, propagation, potting, repotting, watering and feeding. Highly recommended to all gardeners.

THE COMPLETE A-Z OF GARDENING, by Douglas Close. British Book Centre, Inc., 996 Lexington Av., New York, N.Y. 10021. **1973.** Pp. 319. Illus. $14.95. This is a catalog of over 1,000 ornamental plants arranged alphabetically by genera. In each case brief cultural directions are given. At the end a comprehensive cross-index is provided so that a plant can be traced by whatever name you may know. Recommended to gardeners generally.

VEGETABLES AND FRUITS, edited by James Underwood Crockett & Richard Crist. Time-Life Books; retail distribution: Little, Brown & Co., Boston, Mass. Library & school editions: General Learning Corp., 250 James St., Morristown, N.J. 07960. Time-Life Publications, Rockefeller Center, New York, N.Y. 10020. **1973.** Pp. 160. Illus. This is the 12th volume in the Time-Life Encyclopedia of Gardening. It comes up to the very high standard set by the previous volumes. The book is profusely illustrated in color, including the reproduction of 98 water color drawings by Richard Crist. Section 1 is devoted to the topic of the joys of growing your own. Section 2 is concerned with the planning and planting of vegetables: choosing your crops, preparing the soil, starting seeds, using the cold frame, controlling weeds, and using mulch, and ending with an expert's vegetable garden. Section 3 is devoted to the raising of fruits, nuts and berries: the fruits—strawberries and bush fruits. Section 4 is concerned with practical and pleasing herbs: culture, preservation, drying seeds and bulbs, growing as house plants. Section 5 presents an encyclopedia of vegetables, fruits, nuts and herbs. Very highly recommended.

JAPANESE GARDENS REVISED, by Kiichi Asano and Gisei Takakuwa. English adaptation by Frank Davies and Hirokuni Kobataka. Charles Tuttle Co., Rutland, Vt. 05701. **1973.** Pp. ix + 165. Illus. $17.50. This is a very wonderful book with 110 breath-taking, utterly beautiful color illustrations of Japanese gardens of various historical periods. These alone are worth much more than the price of the book. These are followed by a brief history of Japanese gardens, and discussions of garden planning as an art, materials and sense of beauty, and an alphabetical list of gardens. Words fail the reviewer in describing the utter enchantment provided by this book offering. Recommended without reservations at all.

TROPICAL FLOWER ARRANGING: A PRACTICAL GUIDE, by Nancy Aldrich Inman. Charles E. Tuttle Co., Rutland, Vt. 05701. **1973.** Pp. 116. Illus. $8.25. This unique book on flower arranging in the tropics fills a definite need. It details the joys and frustrations when working with tropical materials. The six chapters are devoted to natural containers, colorful foliage, dried materials, the ubiquitous coconut, fruit and flowers, and poisonous plants. Very highly recommended to all interested in flower arranging.

AMARYLLIS LEOPOLDII T. MOORE, **EMEND.**

Hamilton P. Traub

The *Amaryllis* flower is typically irregular with the tepalsegs of four different shapes and sizes and it seemed impossible to breed for wide open flowers with tepalsegs more or less of the same shape and size until Richard William Pearce in 1865 collected what was later named *Amaryllis leopoldii* T. Moore for Messrs. James Veitch & Son, renowned English *Amaryllis* breeders. Pearce indicated that this species was collected in Peru. Messrs. Veitch and other breeders developed from this species the large-flowered hybrids with wide-open flowers with fairly regular tepalsegs known today as the Leopoldii hybrids. As time passed the stock from the wild was lost under cultivation. With the revival of interest in *Amaryllis* in America during the 1930's, a search was made for *Amaryllis leopoldii* in the supposed native habitat in Peru but with-

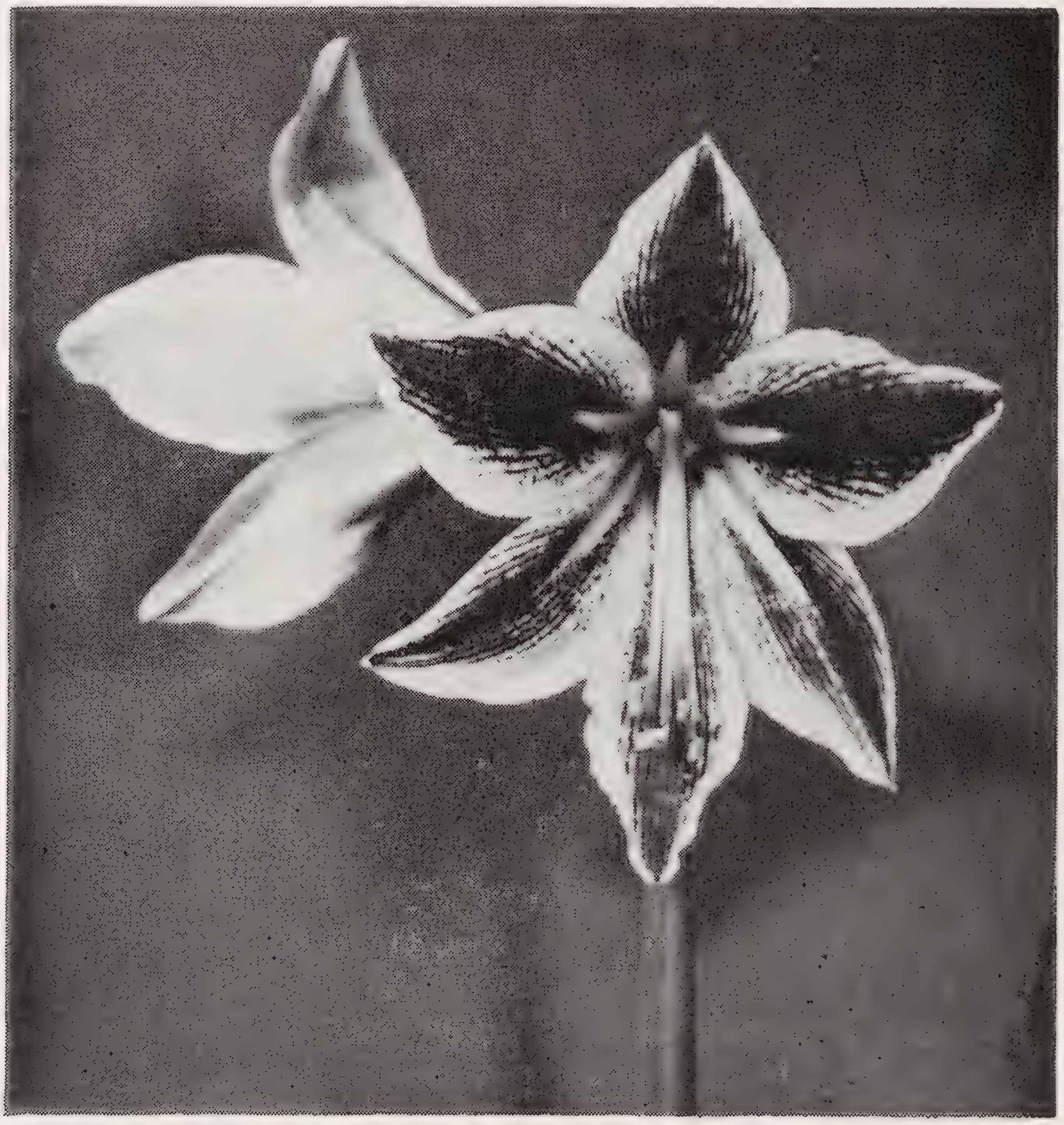

Fig. 25. **Amaryllis leopoldii** T. Moore, the species with the most regular flower in the genus. Reproduced from a black and white print made from a color slide. Compare **COVER design** which was made after the color slide in which the hair-line of red on the edges of the segs is visible. Photo by Thomas W. Whitaker.

out any success.

This stalemate was broken recently when the late Dr. Martin Cardenas solved the riddle of the missing *Amaryllis leopoldii* by showing that it is native to Bolivia.

According to Cardenas, ''Really, with the exception of the white bifid bar appearing in the throat of *A. leopoldii,* my new species has all the floral morphology of *A. leopoldii.* Pearce, as well as the other early collectors of ornamental plants were obliged for business reasons to avoid the mention of the right places where they found the most valuable plants. Accordingly Pearce indicated that *A. leopoldii* and also *A. pardina* are from Peru. However, to my knowledge they have not been re-collected in that country. On the contrary, at least *A. pardina,* in two varieties, has been found by Prof. Nelson and me as true wild plants in Bolivia . . . *Amaryllis pseudopardina* [=*A. leopoldii* T. Moore] comes from Yungas de Corani [in Bolivia].''

Cardenas collected three forms of *Amaryllis leopoldii,* giving them new names (see Cardenas, 1965, 1972 and 1973, under synonyms below).

The illustration (Fig. 25), which has been designated as the lectonomenifer illustration, shows a form collected by Dr. Cardenas which is near to the type illustration, but which latter Gard Chron. I (1870) 733, Fig. 140) is recognized as surely ''idealized''.

Thus, thanks to the late Dr. Cardenas, our long search comes happily to an end. It is hoped that this plant will not be allowed again to die out under culture as in the past, but will be treasured in cultivation as an insurance that it will not become extinct.

Amaryllis leopoldii T. Moore, **emend.**

Gard. Chron. i(1870) 733, Fig. 140; Traub & Moldenke, Amaryll. 118. 1949; Traub, Amaryllis Manual, 276-277, Fig. 7, middle right. 1958.

Lectonomenifers Thos. W. Whitaker s. n. (No. 1123 TRA), Apr. 5, 1973, cult. Burbank, Calif. from bulbs collected by Martin Cardenas in Bolivia, Prov. Chapare, Dept. Cochamamba, Yungas of Corani, alt. 1,500 m. in 1959.

Paranomenifers (1) J. L. Doran s. n. (No. 1124 TRA), May 23, 1971, Cult. Burbank, Calif. from bulbs collected by Martin Cardenas in Bolivia, Prov. Chapare, Dept. Cochabamba, Yungas of Corani, Bolivia, alt. 1,500 m.

(2) J. L. Doran s. n. (No. 1125 TRA), Febr. 15, 1973, from same source as above.

(3) M. Cardenas No. 6094, Herb. Cardenasianum, Febr. 1, 1959, Prov. Chapare, Dept. Cochabamba, Yungas of Corani, Bolivia, alt. 1,500 m.

(4) M. Cardenas, No. 6331, Herb. Cardenasianum, July 1971, Prov. Chapare, Dept. Cochabamba, Peñon de San Julian, Bolivia, alt. 2,000 m.

Syn.—Hippeastrum leopoldii Dombrain, Floral Mag. 9: pl. 475-476. 1870; *Amaryllis pseudopardina* Cardenas, Plant Life 21: 55-57; 60-63, Fig. 9. 1965; Plant Life 23: 35, Fig. 16. 1967; *Amaryllis neoleopoldii*

Cardenas, Plant Life 28: 52-54, Fig. 17-B. 1972; *Amaryllis leopoldii* forma *whitakeri* Cardenas, Plant Life 29: 36, Fig. 10. 1973.

The description given by T. Moore (1870) is incorrect in certain parts, particularly the omission of the description of the paraperigone; this is short, closed in at the throat. This fact removes this species from the Subgenus AMARYLLIS, and places it in the Subgenus OMPHALISSA (Salisb.) Baker.

This species is somewhat variable in the regularity of the segs and the color pattern. The following description is based primarily on the lectonomenifer specimen plant. In making identifications this should be taken into consideration. The species is related to *A. pardina* Hook f. and some minute dotting in red may be present but it never predominates.

Lectonomenifer description.—*Bulb* globose, 5-6 cm high. *Leaves* 4, strap-shaled, apex acute, 30-35-41 cm long, 2.5-4 cm wide. *Scape* hollow, dull green, slightly compressed, 22-28 cm long, 1.7 cm diam. (base), narrowing gradually to 1 cm. in diam. at the apex. *Spathe* 2-valved, reddish at anthesis, upright, 7-7.5 cm. long. *Umbel* 2-flowered, flowers in nomenifer plant wide open with 5-pointed greenish star in throat, crimson (HCC 824/3) in center, bordered whitish, and a hair line of reddish on edges, whitish on underside. However the color pattern is somewhat variable in some of the other collections. *Pedicals* upright, dull green, 3.5-3.7 cm. long. *Ovary* oblong, dull green, 1.5 cm long, 0.8 cm. in diam. Tepaltube broadly funnel-shaped, 1 cm. long. *Paraperigone* closing in the throat, short whitish bristles on the border. *Tepalsegs* oblanceolate; top seg, 10 cm. long, 4.5 cm. wide, bluntly apiculate; 2 side setsegs 10 cm long, 4.2 cm wide, bluntly apiculate; 2 side petsegs 10.4 cm long, 5 cm wide, bluntly acute; bottom petseg 10 cm long, 4 cm wide, bluntly acute. *Stamens*—filaments whitish greenish in lower ½, red above, shorter than the segs; anthers 7 mm. long, pollen creamy to light yellow. *Style* subequaling the stamens or little longer, colored the same as the stamen-filaments; stigma shortly 3-lobed. *Capsule* deeply 3-lobed, 3 cm. long, 3 cm. in diam., dark green. *Seeds* flat, D-shaped, dark brown, 1.8 cm. long, 1.4 cm. wide.

Range.—Bolivia: Privince Chapare, Dept. Cochabamba: (1) Yungas of Corani, alt. 1,500 m.; and (2) Peñon de San Julian, alt. 2,000 m.

AMARYLLIS ANGUSTIFOLIA, AN AQUATIC SPECIES

Hamilton P. Traub

In the 1969 PLANT LIFE (see page 33), Prof. Gomez C. Ruppel reported on the collection of *Amaryllis angustifolia* (Pax) Traub at Santo Tomé, Corrientes, Argentina. He sent bulbs of this to Mr. Paul H. Williams, 6128 Subdown Drive, Fort Worth, Texas 76114.

Some of these bulbs made 6 leaves and flowered for Mr. Williams in 1969 (see PLANT LIFE 1970, page 65). The flowers were similar to those of "*Sprekelia* but not quite so full in appearance."

Bulbs of *Amaryllis angustifolia* were received by the writer from Mr. Paul H. Williams on May 11, 1968. They flowered for him in May 1969. The bulbs were oblong, 5 cm. long, 3 cm. in diam., neck 12 cm. long, 2 cm. in diam., leaves strap-shaped, umbel 4-flowered. The flowers were somewhat irregular and similar to those of *Sprekelia*. A specimen has been preserved in the herbarium.

Mr. Russell H. Manning, of Spring Valley, Minn., writes under date of Nov. 4, 1973, that he has had *Amaryllis angustifolia* for some years. His bulbs produced flower scapes but the buds aborted due to not keeping the plants in wet enough soil.

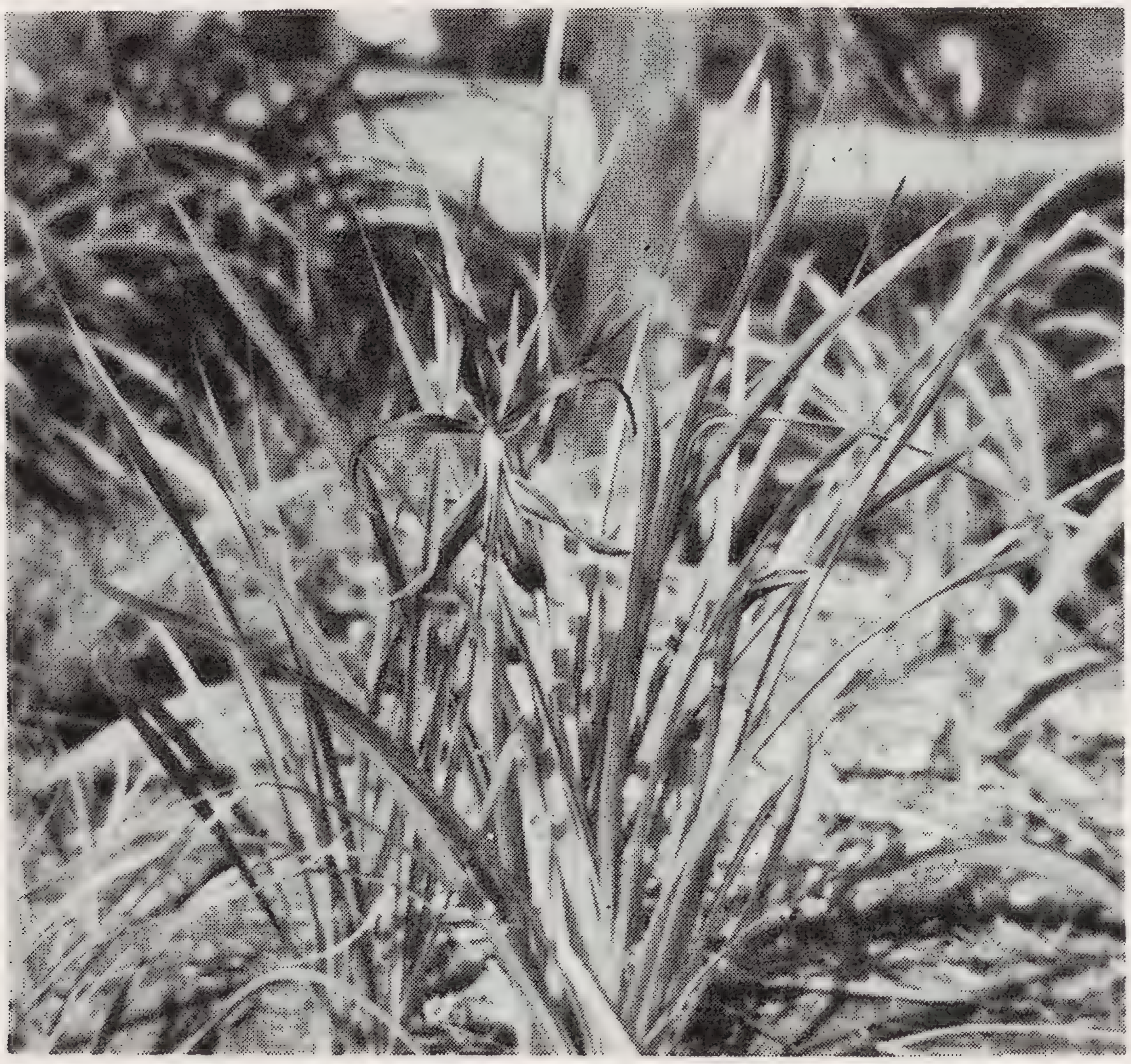

Fig. 26. **Sprekelia formosissima** forma **williamsii**, a very robust form that thrives out of doors in northern states; bulbs are stored in cellar or basement over winter. From color photo by Paul H. Williams.

On March 6, 1973, Mr. Sterling S. Harshbarger, 161 S. Virginia Ave., Pasadena, Calif. 91107, sent the writer specimen material consisting of one floret and a strap-shaped leaf of *Amaryllis angustifolia* which was dried and mounted for preservation in the herbarium.

Thus, this species is becoming established in the United States and it is hoped that others will report on their experiences with this most interesting plant.

Since this is an aquatic *Amaryllis* species it should be well adapted to Florida conditions and could be naturalized in swampy regions.

SPREKELIA FORMOSISSIMA FORMA WILLIAMSII

HAMILTON P. TRAUB

Mr. Paul H. Williams, Jr., of Forth Worth, Texas, under date of October 29, 1973, writes that the robust form of *Sprekelia formosissima* (Fig. 26) was obtained from the Grower's Exchange (in Michigan) in 1959. The flower color has a mahogany cast, and some refer to it as brown-red. This robust form is distinct with reference to size, and it is named *Sprekelia formosissima* forma *williamsii** (see Fig. 26).

Mr. Williams crossed forma *williamsii* with *Sprekelia formosissima* var. *superba* as pollen parent in 1960. One bulb of this cross was much larger than the seed parent, but the segs were not as wide as those of the pollen parent. The flower was distorted and the scape was too weak to stand upright.

Mr. Russell H. Manning of Spring Valley, Minnesota received seeds of this cross, but the plants obtained from these are apparently pure forma *williamsii* since they are robust like the pod or seed parent. This indicates that these progeny are apparently parthenocarpic in origin.

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* **Sprekelia formosissima** forma **williamsii** Traub, **forma nov. Typus: No. 1126 (TRA). Cult.**

SPREKELIA-AMARYLLIS CROSS?

RUSSELL H. MANNING,
Spring Valley, Minnesota 55975

The writer has several times in the past attempted to cross species in the genera *Amaryllis* and *Sprekelia* for it had been reportedly done by Luther Burbank who is said to have some outstanding hybrids from such a cross. However, Burbank's work has never been verified. With the report in the 1970 PLANT LIFE, page 117, with photo of a cross of ''Sprekelia x Amaryllis?'' in mind, the attempt was again made here this year (1973).

The *Sprekelia* plants trace back to Mr. Paul H. Williams, Jr. of Fort Worth, Texas, who in 1967 sent *8 seeds* which were listed as a cross between *Sprekelia formosissima* forma *williamsii* (see article by Traub in the present issue of PLANT LIFE) and *Sprekelia formosissima* var. *superba*. As indicated in the previous article, these seedlings are apparently pure *Sprekelia formosissima* forma *williamsii*. The seedlings have long necks similar to those of common Sprekelias but thicker and longer.

In 1973, the forma *williamsii* was crossed with a very vigorous Dutch type hybrid *Amaryllis* (pod parent) obtained from the Begonia Society's Seed Fund. The *Amaryllis* had been received by this Society from Mr. Don Horton in 1959.

Both of these lots of bulbs were grown out of doors in summer and stored in a cellar in winter here in Minnesota.

Six crosses were made; pollen was applied repeatedly, with foil on the stigmas as the weather was cold, wet, windy and rather continuously nasty. Five seed-pods set, but one was broken off when a bird lighted on it. Thus, only four filled out fully. The seeds from the first pod were panted here, and two seedlings were obtained. After calling Dr. Traub by phone, the next pod was sent to Dr. Bell in Florida to culture the seeds (see 1972 PLANT LIFE pp. 72-76), since it was not yet known whether any would survive by the usual sprouting on top of water technique (floating seeds on water in good light) and at last report he had some success. The third pod was sent to Dr. Traub in California who wrote later that he had six seedlings from eleven seeds. The seeds from the fourth pod gave eight seedlings here in Minnesota.

We will not know if we have a true cross between *Amaryllis* and *Sprekelia* until the seedings flower. There is a possibility that the seeds from the *Amaryllis* stimulated by the *Sprekelia* pollen may be parthenocarpic. The results will be awaited with the greatest interest.

ADDED NOTE.—The use of *Lavoris* in the water used for sprouting Amaryllis seeds keeps down the mould. Dr. Traub used *Lavoris* also at my suggestion and he reports success with it.

AMARYLLID NOTES, 1973

HAMILTON P. TRAUB

Bulb of *Nothoscordum mahuii.*—In the description of this species on page 34, 1973 PLANT LIFE, the bulb was not described in detail. This information is now furnished: *Bulb* ellipsoid in long-section, almost corm-like with a single, very thin light brownish bulb coat, 2.3 cm. long, 1.2 cm. in diam. Roots absent during dormant period. When stock of this species becomes generally available, it should lend itself to pot culture. A number of bulbs should be planted in a 3-inch (7.6 cm.) diameter pot in order to make a good showing. The plant is tiny, and the flowers relatively large in comparison. Two to three flower scapes have been observed issuing successively from the same bulb.

CLASS LILIIDA OF SUPERCLASS **MONOCOTYIDRA**

HAMILTON P. TRAUB

This article will be published in TAXON, journal of the International Association for Plant Taxonomy in 1974 or in a subsequent volume of that journal.

REGISTRATION OF NEW AMARYLLID CLONES

MR. W. D. MORTON, JR., *Emeritus Registrar*

MR. JAMES M. WEINSTOCK, *Registrar*
10331 Independence, Chatsworth, Calif. 91331

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an international basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton, Stuntz and Ballard was published in 1949. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62, 1960; Addendum. PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961: **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues. These may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Polla, Calif. 92037.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine;** and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on, should be sent to Mr. Weinstock at the above address. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1973

Registered by Dr. John M. Cage, 740 Arroyo Rd., Los Altos, Calif

Amaryllis clone 'Mildred' (Cage, 1973) R; A-999; U-4 fld.; Spr. on earlier if forced; 20"h; perigone 2¾" long, 7½" across face, scarlet (HCC19) except for striking ⅜" white band from throat almost to tip of each seg.; formal shape, small bulb.

Amaryllis clone 'Big Tex' (Cage, 1973) R; A-1000; U-4-5 fls on each of 2-3 sequential scapes; 28"h; spr and W; 3" long, 12" across face; solid dark red (RHS46B) front and reverse. Heavy substance.

REGISTRATION OF AMARYLLID CLONES—continued on page v.

EVALUATION OF HYBRID NERINE CLONES

Hamilton P. Traub

The evaluation of hybrid *Nerine* clones for horticultural purposes is practically non-existant, or is rather in a chaotic state. Hybrid *Nerine* seedlings are produced very easily, and at present apparently most of these are named and propagated so that growers have long lists of hybrid clones which are not classified as to *blooming season, flower color, cultural requirements, etc.* This condition has retarded progress toward the popularization of this important group of plants. Thus, it was necessary for the Board of Directors to request the NERINE COMMITTEE to undertake as soon as possible the evaluation of the many existing named hybrid *Nerine* clones, and to require that new hybrid named clones be placed in a classification to be adopted as soon as practicable.

The first project is to be concerned with the grouping of the presently known hybrid clones into color classes, and then to single out the best 10, 25, 50 and 100. In making such lists, the available color charts or fans are to be utilized: (a) the well-known *Horticultural Colour Chart,* (b) the *Nickerson Color Fan,* distributed by the American Horticultural Council (Address, Donald Wyman, Arnold Arboretum, Jamaica Plain 30, Mass.), and (c) the *British Colour Fan.*

Ultimately, a complete classification of hybrid Nerine clones is to be produced, and the known 30 plus natural Species of *Nerine* are to be popularized for their appreciation and utilization in breeding (see PLANT LIFE Vol. 23, 1967, Supplement: Review of the Genus *Nerine*).

The following is a suggestion toward a beginning of a *Nerine* classification for horticultural purposes:

GROUP A. SPECIES

CLASS 1. 30 plus natural species.

GROUP B. PRESENTLY GROWN STANDARD HYBRID NERINES; REQUIRING A DISTINCT RESTING PERIOD

CLASSES: To be worked out on the basis of cultural requirements, flowering season, flower color, etc.

GROUP C. EVERGREEN HYBRIDS, NOT NEEDING A DISTINCT RESTING PERIOD

CLASS. Traubianthe Hybrids (N. x traubianthe Mold., *Nerine filifolia* x Hybrids of group B); evergreen hybrids, see PLANT LIFE 25: 45-46. 1969; PLANT LIFE 24: 102-103. 1968; and PLANT LIFE 23: Vol. 23, 1967, Supplement, Review of Genus Nerine, p. 61.

It is realized that such a classification cannot be produced over night, but it is important to make a beginning as soon as possible.

3. GENETICS AND BREEDING

STOMATAL SIZE AS AN INDICATION OF **AMARYLLIS** POLYPLOIDY

WILLIAM D. BELL AND HERBERT D. STILES*
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Application of clear nail polish (lacquer) to leaf surfaces and subsequent examination microscopically of the resulting impression is a technique often employed in biology teaching. Epidermal imprint methods have been used for more than a generaton (Sax and Sax, 1937). Nevertheless, this continues as a valuable tool for preliminary determinations of ploidy. The relationship of cell size or volume to ploidy has also been reported (Kimber and Riley, 1963).

The lacquer was applied to the upper (adaxial) leaf surface and allowed to dry for about 15 minutes. Hardened lacquer films were then stripped from the leaves for examination. Usually, there was little or no damage to the leaf after removal of the lacquer. Photomicrographs of leaf impressions were made at a magnification of 400X on Kodak Panatomic X film. Further enlargement in printing resulted in a final magnification of 1500X and this was reduced to X765 in Fig. 27; representative stomata at the magnification were chosen for illustration here. For definitive classification, use of fine-grain film with photomicrographs made at 100X is suggested. Average measurements of length and width of a population of stomata can then be determined from enlargements or projections of the photomicrographs. Standardization of leaf maturity, position of somata, and environmental conditions would reduce errors in such determinations (Meidner and Mansfield, 1968).

Examination of the samples shown here indicates that a meaningful relationship may exist between stomatal size and ploidy in the genus *Amaryllis.* Two apparent tetraploids, the cultivars 'Superba' and 'Ludwig's Dazzler' showed larger stomates than those found in *A. evansiae, A. starkii, A. belladonna minor, A. iguazuana* and the hybrid *A. evansiae* x *starkii* (see fig.). Stomates of one of the 'Senorita' hybrids appeared intermediate in size suggesting the triploid condition of this hybrid.

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* Mr. Stiles is presently a graduate student at the University of Florida.

This technique may be of particular interest in evaluating plants treated with colchicine or where a spontaneous doubling of chromosomes is suspected. Treatment with colchicine may affect only a portion of the shoot meristem and produce sectorial or periclinal chimeras. The colchicine treatment may also induce doubling in root primordia without an influence on the shoot. In the latter case, an examination of root tips alone would give misleading information on the ploidy of the shoot and the consequent breeding potential of a plant.

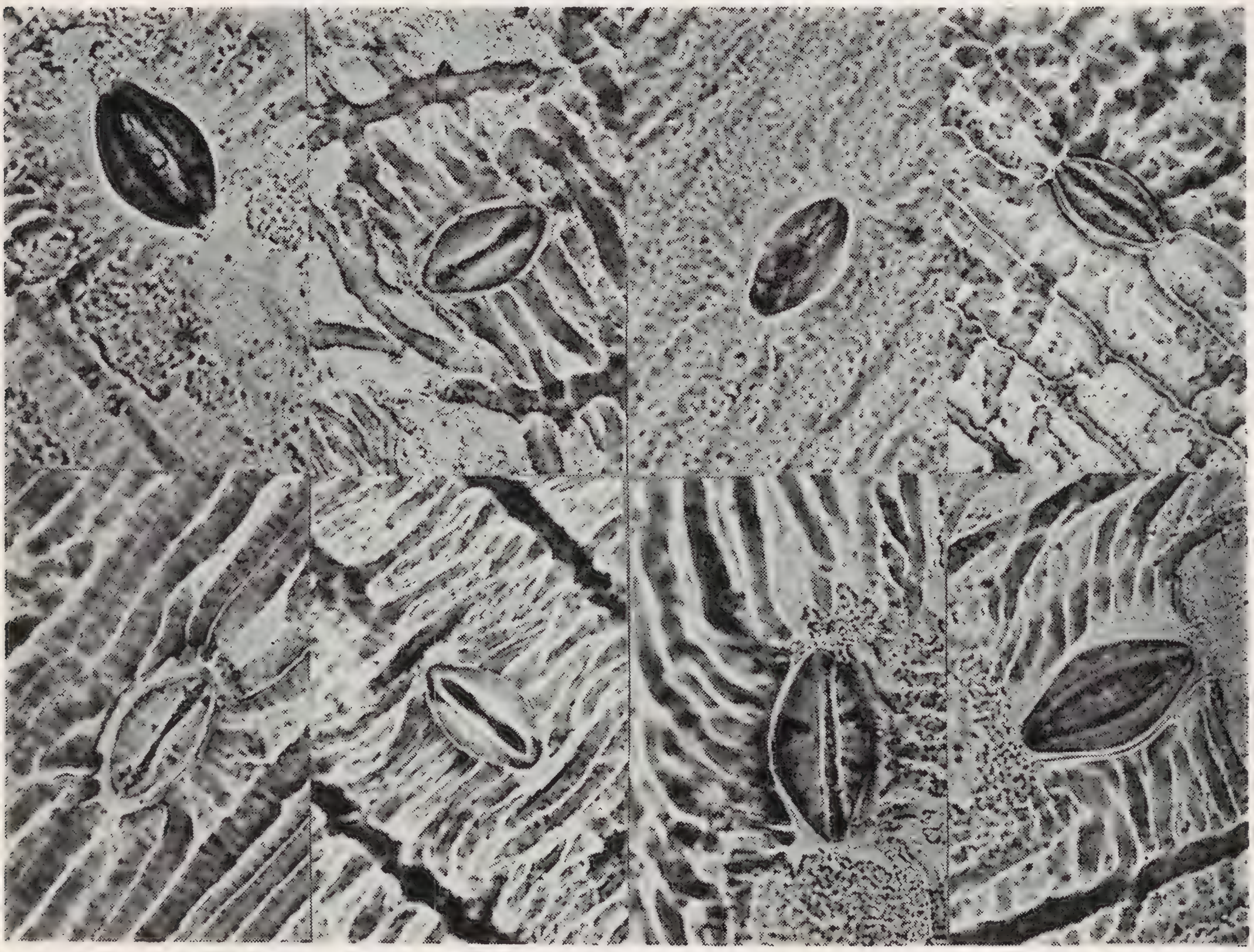

Fig. 27. **Amaryllis** stomata, X765. Reading from **left** to **right: UPPER** clone 'Superba', 'Ludwig Dazzler'; **Amaryllis evansiae;** and **Amaryllis starkii. LOWER, Amaryllis belladonna minor, Amaryllis iquazuana, Amaryllis evansiae** x **A. starkii** and clone 'Senorita'. Photos by Bell and Stiles.

LITERATURE CITED

Kimber, G., and R. Riley. 1963. Haploid angiosperms. Bot. Rev. 29: 480-531.

Meidner, H., and T.A. Mansfield. 1968. Physiology of Stomata. McGraw-Hill Book Co. New York.

Sax, K., and H.J. Sax. 1937. Stomata size and distribution in diploid and polyploid plants. Jour. Arnold Arboretum *18*: 164-172.

TETRAPLOID **AMARYLLIS EVANSIAE**

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Amaryllis evansiae was among the first of the species utilized with the idea of breeding large-flowered yellow hybrids. Unfortunately, many hybrids have been produced by pollinating *A. evansiae* with the pollen of large tetraploid hybrids, usually those described as ''white Dutch.'' Resulting progeny, triploids of low fertility, were more often than not a disappointment. Backcrosses to other tetraploid hybrids further diluted the germ plasm rapidly. Crosses of *A. evansiae* with other diploids such as *A. aglaiae* and/or *A. parodii* produced hybrids more easily grown than the species and in some cases more yellow in appearance. However, the diploid hybrids present the same problems in attempting to combine desired traits where such traits are found in plants differing in ploidy level. Thus, it seemed desirable to attempt to produce tetraploids from existing diploids to facilitate this breeding venture.

METHODS

Several capsules of sibling-pollinated *A. evansiae* were harvested about 4 weeks after pollination. The immature seeds were placed in sterile culture on a mineral-sucrose aqueous medium (Bell, 1972) but agar was omitted. One to 2 weeks later, when some had begun to germinate, all were transferred to aqueous 0.2% colchicine with 2% sucrose for 24 hours. Treated seedlings were in some cases punctured with a sterile needle to facilitate entrance of the colchicine. Plantlets were then washed in sterile water and transferred to the mineral-sucrose medium which in this case was solidified with 1% agar. Crosses of *A. evansiae* with other diploid species and hybrids were treated similarly.

RESULTS AND DISCUSSION

Initially, plantlets began to display signs of colchicine injury within a week. Approximately 20% of the treated material failed to develop further on the medium although supplied with sucrose, minerals and illumination. Another 10-15% survived for several weeks but produced large, hypertrophied cells and eventually lost pigmentation. The latter also failed to survive leaving 70% or less of the initial population. Among the survivors were virtually all of the earliest germinating plantlets including those which had been perforated with a needle.

Distortions of growth patterns were common among the plantlets which remained—most showed irregularities in leaf development. Often, leaves tended to bend in a lateral direction. Newly produced leaves were usually curved in the same direction suggesting that such plants were actually chimeras made up of mixed cell sizes. As the plants continued to develop new leaves, longitudinal strips of thicker leaf tissue were not rare. In fact, this proved to be the best clue so far that the plants were at least partially polyploid. When the thicker strips were near midribs, little bending was noticed.

One problem encountered was that root formation was often severely inhibited, particularly among the most stunted plants. However, I suspect that aseptic conditions favored the recovery of this group. As long as some leaf development continued, they were maintained and patience was rewarded by eventual rooting of most of these plants.

One year after the colchicine treatment, many of the plants had reached the 4-5 leaf stage. Those with the thickest or most distorted leaves tended to show slower growth than those showing no abnormalities, another indication of possible polyploidy in the slow-growing plants. Incidentally, there appeared to be no condition that might be interpreted as a simple overgrowth of diploid tissue. Thicker strips were found to be constant in the leaves which developed after a thick strip was first observed.

The most-likely candidates have been scored by a method suggested for this purpose (Bell and Stiles, 1974). Apparent success was indicated for one of several treated *A. evansiae* displaying uniformly thicker leaves. Guard cells on the upper leaf surface were approximately 50% longer than those of diploid *A. evansiae* leaves. Another which was visibly similar, on the other hand, was found to have guard cells of the same size of the untreated species.

Treatment of the diploid hybrid, *A. evansiae* x *cybister,* produced several candidates from a single capsule of treated seeds. One plant from this treated group is now growing with no visible abnormalities but with large guard and epidermal cells which can be distinguished microscopically at 100X when compared side by side with impressions made from untreated material of the same cross. Another appeared at an early stage that it would not survive, but finally initiated 3 shoot meristems. One of the latter is growing more rapidly than the others which are scored as probable tetraploids. Approximately 100 other plants from this and other diploid *A. evansiae* crosses remain to be scored. Some are still severely stunted. All are being maintained on the chance that additional sorting of polyploid tissue may occur such as when offsets are produced. Chromosome counts of root tips have not yet been made on those scored as probable tetraploids.

In inducing polyploids, only one layer of the growing point may be doubled by the colchicine treatment (Eigsti and Dustin, 1955). And, that layer may or may not give rise to the germ tissue. Therefore, proof of the success of this venture will be in the production of viable gametes with a chromosome count double that of gametes produced by diploid plants. Leaf impressions are a very useful method for preliminary screening, but could also be misleading if the plant were a chimera of diploid and polyploid tissue.

Other methods of polyploid induction should be tried, particularly for those who do not have access to facilities for aseptic culture. I suggest that those interested in attempting to induce polyploids use known diploid material or perhaps triploids. A natural hexaploid, *A. apartispatha,* is known (Traub, 1958). It would be interesting to learn if a diploid pollinated with a hexaploid would yield fertile tetraploid progeny. This would indeed be a shortcut, especially if the hexaploid had desirable qualities.

LITERATURE CITED

Bell, W.D. 1972. Culture of immature *Amaryllis* embryos. Plant Life *28*: 72-76.

Bell, W.D., and H.D. Stiles. 1974. Stomatal size as an indication of *Amaryllis* polyploidy. Plant Life.

Eigsti, O. J. and P. Dustin. 1955. Colchicine—in Agriculture, Medicine, Biology and Chemistry. Iowa State College Press. Ames.

Traub, H.P. 1958. The Amaryllis Manual. The Macmillan Co. New York.

TRUE-BREEDING AMARYLLIS LINES—PROGRESS REPORT

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In *Plant Life,* 1973, p. 53, the writer advocated the inbreeding of promising strains of Amaryllis until certain desirable traits have become stable. Once that has been accomplished, inbred strains can be crossed with other inbred strains to find combinations having good quality, uniformity, and hybrid vigor. *Complete* stability in an inbred strain can only be approached after many generations of close breeding, but only a *few* generations of selfing and/or sibling-crossing and/or back-crossing on parents has been found to produce superior breeding stock.

The writer's main work has been with true-breeding, large, solid-red Leopoldii types. About five lines have been tentatively selected for breeding stock, and these lines have been inbred from three to seven generations. Crosses between some of these lines produce uniform seedlings of exhibition quality and solid color without blemish. Obvious weaklings among the seedlings are rogued after about three true leaves are formed. Fewer weaklings are found among the ''F:1'' crosses in each generation.

Orange, pink, white, miniature red, and dotted strains are not as far advanced as the reds, but they show much promise.

A few observations on line breeding follow. A more complete discussion will be submitted next year.

1. Selfing is the most severe form of inbreeding. If a superior seedling can be derived from each selfed generation, selfing can

produce uniform stock in few generations, but so many very weak seedlings are produced that the breeder may find none worth saving in a whole batch. When the problems of selfiing become too frustrating, sibling crossing should be mixed into the program.

2. Blind alleys are sometimes found in inbreeding. Crossing a weak inbred seedling (having stability and some good qualities) back on a vigorous ancestor can break the deadlock and permit some more useful inbreeding.

3. Crosses between some stabilized inbred lines do not produce vigorous seedlings. One should suspect triploidy or anenploidy in this case, and special procedures are required to work further with the strain. See Bell's paper, The Role of Triploids in Amaryllis Hybridization, in the 1973 PLANT LIFE.

4. Crosses between red inbred lines and named red clones of mixed parentage seem to produce more outstanding seedlings than crosses between two named mixed parentage clones. The named clones may already be somewhat inbred.

5. When inbreeding is commenced on a strain, a few generations of experimentation may be required to find which genetic characters are tending to stabilize. Only those characters that are homozygous can readily be stabilized by inbreeding.

To digress from the main topic, the writer recommends a revision of show standards in regard to ''throat green,'' for which no points are deducted at present by the judges. A green throat is not necessarily ugly in *Amaryllis,* and since most of the vigorous early American hybrids had some color break in the throat, it is easy to understand why the show standards were written as they exist. However, green streaks and blotches are unattractive in some plants by any artistic standard. Should not the show standards allow beautiful green throats and penalize ugly ones? Ludwig's 'Happy Memories' is a lovely bi-color with a green and white center, but 'Fire Dance' would not be merchandisable if it had irregular green streaks in its throat.

SUMMARY—**HYBRIDIZATION** AND POLYPLOIDY IN RELATION TO **AMARYLLIS** SPECIES AND CULTIVARS

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Out of the 47 or more species recorded in the genus *Amaryllis*, only 18 species were available to be studied cytologically. In the present investigation only 50 cultivars covering 5 elemental species (*A. vittata, A. belladonna, A. stylosa, A. reticulata* and *A. species*) were studied. Among the elemental species *A. stylosa, A. reticulata* and *A. species* are diploid, whereas *A. vittata* was found to be both diploid and tetraploid. *A. belladonna* occurs in 3 races, namely diploid, triploid and tetraploid. In cultivars, 30 are diploid, one is triploid and 14 are tetraploid.

Diploid taxa: The basikaryotype contain 2 median, 5 submedian and 4 subterminal chromosomes. There are only 2 satellited chromosomes in the somatic complement. While there is in general great homogeneity in the karyotypes of elemental species and cultivars, *Amaryllis* species and nearly 71% diploid cultivars differ karyotypically. This difference was in the location of centromeres in the VIII pair. In *A. vittata, belladonna, A. stylosa* and *A. reticulata.* VIII pair has median (V) to submedian (L) centromere position, while in *Amaryllis* species it has highly subterminal centromere (J). In the heterozygous cultivars number of V, L and J chromosome was found variable and the VIII pair always contained one V or L and other J chromosome.

The male meiosis of elemental species and diploid cultivars, was regular except in *A. stylosa* which is a structural heterozygote. The 11 bivalent have an average of 21.57 ± 0.34 *(A. vittata)*, 25.3 +0.23 *(A. belladonna)* to 20.0 ± 0.26 *(A. species) chiasmata* per cell Anaphase I and tetrad formation are normal. Pollen fertility ranged from 20.0 to 64.0%. *Amaryllis* species were totally pollen sterile. Pollen grain mitosis has also revealed the occurrence of expected numbers and morphology of the chromosomes.

Polyploid taxa: The only one cultivar (cv. 110) was triploid with $2n = 33$. The somatic complement of 33 chromosome is composed of $6V + 15L + 12J$, which is an exact multiple of $2V + 5L + 4J$. Male meiosis was characterised by presence of high number (6-8) of trivalents. The meiotic behaviour coupled with karotype similarities of the triploid cultivar show autoploid characters. The somatic complement of tetraploid taxa consist of $8V + 20L + 16J$ chromosomes which is an act multiple of $2V + 5L + 4J$. The meiotic behaviour of the tetraploid species and majority of the tetraploid cultivars was characterised by the presence of high number of quadrivalents (5.6 ± 0.26 to 9.4 ± 0.61) and bivalents. However, on the other extreme, there are cultivars where the frequency of quadrivalent goes down to 2.8 ± 0.18 to 4.75 ± 0.32 per cell. This was also accompanied by 6.4 ± 0.40 to 4.0 ± 0.2 univalents. This shows that former has autoploid characters while latter may be segmental allotetraploid.

Heterozygosity in A. stylosa: In this heterozygote during male meiosis, rings or chain involving 4 chromosomes were regularly obtained. The interchange multiple is also karotypically detectable, because of the heteromorphic nature of 2 pairs of chromosomes. Though 92.59 percent interchange multiples show alternate disjunction, there is only 56% pollen fertility. The reduced fertility seems to result from the presence of an interstitial chiasma in the interchange multiples. However, vegetative reproduction not only conserves high level of heterozygosity but also circumvents high level of sterility.

Aneusomaty: During the course of cytological survey, aneusomaty was found in the root tip mitosis of cv. 'Andromeda', a tetraploid cultivar of hybrid origin. It contains 44 chromosomes in nearly 86.5% cells. In the remaining 13.5 of cells, chromosomes numbers range from 34-45. A comparison of karotype of the variant and normal cells revealed that while all types of chromosomes are lost in different frequencies, the gain is confined only to smaller ones. Furthermore, chromosome type X is both lost and gained most frequently. The cellular basis of the origin of aberrant cells lies in the double plate metaphases and split anaphases.

It is concluded that polyploidy appears to be one of the chief cause of these aberrations. Aneusomaty may thus be looked as an attempt to regain the nucleo-cytoplasm ratio found at diploid level. This is followed by hybridity involving, incompatible genic and/or cytoplasmic combinations. In fact all the 3 factors are correlated. The role of aneusomaty in evolution and speciation is not very clear, at any rate it does not appear to be important in creating varietal diversity in *Amaryllis*.

Hybridization: Limited success has been achieved in raising interspecific hybrids. Only 2 combinations involving *A.* species X *belladonna* and *A. vittata* X *A. belladonna* were successful. The hybrids obtained from *A.* species (subgenus *Macropodastrum*) X *A. belladonna* (subgenus *Amaryllis*) is not only sterile but also had malformed anthers like *A. species.* The other interspecific hybrid *A. vittata* (subgenus *Lais*) X *A. belladonna* (subgenus *Amaryllis*) is fertile with perfect meiosis in the F_1 hybrid. This indicates that the two parents are genetically very close. In the absence of meiotic studies in *A.* species X *A. belladonna.* it is not possible to say anything about the nature of its sterility.

Nine intervarietal hybrids involving 2x X 2x and 4x X 4x levels and one from interploidal crossing (4x X 2x) were also obtained. These have been assessed for their horticultural characteristics.

The present results and those of the earlier authors on *Amaryllis* reveal that hybridization has been an important single factor involved in the origin of garden cultivars. All the important hybrids like *A.* X *johnsonii, A.* X *acramannii,* 'Acramannii Pulcherima', 'Gravena', 'Empress of India' and several Reginae (*A.* X gh. *reginaeoides*) and Leopoldii (*A.* X gh. *leopoldaeoides*) hybrids evolved through hybridization. Transgressive segregation seems to be one of the important ways by which flower size increased considerably over the species which show little variation. Regarding the elemental species relevant to the origin of garden amaryllis mention may be made of *A. belladonna, A. reginae, A. striata, A. reticulata, A. vittata, A. aulica, A. pardina, A. leopoldii, A. espiritensis* and *A. psittacina.* This is a reasonably wide base of germplasm from which appropriate gene combinations have been selected over the years.

Next to hybridization, polyploidy has played an important role. Majority of the large flowered types are tetraploid. Of particular interest are the triploid hybrids which are outstanding and surpass in all floral characters over their diploid and the tetraploid parents. While a basic karotype is recognizable, there is a good deal of karotypic heterozygosity which may be due to para-and pericentric inversions, interchanges etc. One clear evidence of interchange has been brought out in this work.

4. AMARYLLIS CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIS GROWING

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From correspondence and visits with growers in many parts of the world I have heard of many troubles and heard statements like: ''I can't grow this species because it is too hot here—or too humid—or some other reason.'' Having grown, maintained, and bloomed over 125 variants and types of more than fifty species, along with many hybrids, I would like to discuss some growing practices that might be helpful.

The primary faults I have tried to overcome and observed also with other growers are:

1. Improper watering
2. Over fertilizing
3. Too much organic material in potting mix
4. Insufficient light
5. Lack of proper vernalization

1. SOIL MOISTURE

Material in a pot is not at all like the soil in a field. When a pot is saturated with water it remains saturated and does not drain out, a condition the plant never enounters in its habitat. An analogy would be a pot containing a sponge saturated with water. While soil in a field is rapidly reduced from the saturated condition by the ''blotter'' action of the surrounding soil and subsoil. This rapid reduction of water content after a rain or irrigation aerates the soil. For this reason watering practice becomes the most important aspect of culture of plants in a pot. My observations have been that most growers do not let the pot dry out sufficiently before watering. From a number of trials we have found the plant should go to 40 centibars or more before watering. I have run plants to 60 centibars with no problems. When using sandy soil, if one digs ½-1 in. deep, 40 centibars of tension appears barely moist, i.e., you can just tell that it is moist while the soil above is dry. For further discussion of this see Holly, W.D. and Baker, Ralph —''Carnation Production 1963'', p.57-59, Wm. C. Brown Co., Inc. and ''Soil, the Yearbook of Agriculture 1957,'' U.S. Printing Office, Washington, D.C., p. 49-60. Of course, the acquisition of a *tensiometer* would be the best way to teach oneself how to water. Tensiometers are available from many sources. Two are: Randolph Matson, 1954 Camino Loma Verde, Vista, California 92083; and, Irrometer Co., Inc. P.O. Box 2424, Riverside, California 92506. The electrical conductance instruments are usually reliable if calibrated against a tensiometer in the same soil and fertilizer program.

It is important that when a pot is watered it should be thoroughly wet and enough water put in so a good quantity runs through. If water supply is in any way saline (don't overlook the fertilizer salts) the amount run through should be ample to insure no saline build up.

2. SOIL FERTILITY

We have over the past few years run a number of trials in an effort to determine the requirements of mature bulbs and seedlings. Seedlings of *A. fusca* were grown in 3″ pots and fed at every watering 90, 180, 250, 320, 390 p.p.M. N with 36 ppM P_2O_5, 72 p.p.M K_2O with no essential difference in size. The seedlings showed good growth. The ones on the higher nitrogen feeding showed no ill effects. These would seem to indicate that amaryllis are not sensitive to high nitrogen supply and also shows they do not require large quantities of nitrogen. Of course there is a possibility of other limiting factors. Many ''Dutch hybrids" have been grown with leaves 8 cm. wide and 1¼ meters long which produced 30-40 cm. circ. bulbs with only 75 p.p.M N for May, June and July. The use of soil, effluent, and tissue analysis have indicated need for only mediocre amounts of phosphorus but large requirements for potash. The last couple of years I have used 75 ppM N, 40 ppM P_2O_5 and 50 ppM K_2O until about August 1st, then formula is changed to 50 ppM N, 25 ppM P_2O_5, 100 ppM K_2O. In early Sept. change to 100 ppM K_2O, in October clear water. For those who wish to compute their own liquid feed, multiply the percent of fertilizer by 75 to get ppM in 100 gallons for every ounce used. Example: Calcium nitrate is 15.5% N, .155x75=11.6 ppM N when one ounce is put in 100 gallons of water. Ozmocote 14-14-14 in ½, 1, & 2 teaspoon rates have been put in pots of hybrids to compare with liquid fed bulbs. These bulbs also received the same liquid feed. No increase in growth was noted, leading to the conclusion that the liquid feed supplied all the requirements of the plant. The source of NPK is all from inorganic salts: KNO_3, CA $(NO_3)_2$. $NH_4H_2PO_4$, and K_2SO_4. I do not like to use any organic material, as I believe this is a source of disease organisms which cause root and bulb rots. When these were eliminated from the program very noticeable improvement was shown. Also, I like to avoid the use of ammoniacals and urea as much as possible. Micro nutrients were added with fertilizers at the rate of: 2 B, .09 Mn, .02 Cu, .09Zn, .75 Fe, .03 Mo, .01 Co (all stated in ppM); Ca was maintained above 60 ppM and Mg above 5 ppM. Uusually with greenhouse crops 3-6 pounds of nitrogen per year per 100 sq. ft. is considered adequate. If 500 6″ pots are equivalent to 100 sq. ft. of bench and 1 quart a week is used for the 3 months period, this would equal one pound of nitrogen per 100 sq. ft.; however, with the leaching used in the program, I feel that actual available nitrogen is much less. Tissue analysis always showed an adequate supply. Phosphorus in the form of superphosphate is always added to the mix and analysis never shows a deficiency but it was always added to the liquid feed to insure availability. Potash was always sufficient in tissue analysis but in effluent and soil analysis it was always low. The ratio to nitrogen was kept high and in the fall of the year it just seemed to disappear in the pot. For this reason potash was increased in the fall and the increase has not caused any problems but might require a check for salinity.

Observation of growing practice in Holland would at first seem that huge quantities of fertilizer are used; however, the near 100% organic growing medium combined with a watering procedure, which would rapidly leach the fertilizer salts, would indicate that the plant is lightly fed. When most people grow plants in pots and feed as heavily as has been observed, I believe that the plants are damaged both by excessive fertilizer and salinity. In my own program I believe that excessive amounts are still being used and in the future plan to reduce the amounts to about two thirds of what is presently being used. In observed programs where solid fertilizer materials are used there is always the feast or famine phenomena: too much when just applied and then none in a short time resulting in saline damage and then starvation periods. A condition of this kind certainly would not get the best growth response from the plant and in case of the more sensitive species might result in loss of bulbs. Constant liquid feed avoids this condition.

3. ORGANIC MATERIAL

The potting mixes that have been recommended are usually from ⅓ to ⅔ organic. When the organic material is very course and fibrous the mix has excellent aeration, but as decomposition takes place it becomes a slimy mass that is a ''disaster area'' for a root system. Bulbs have shown excellent growth when planted in sphagnum moss for the first few months, then the moss rots out and becomes a wet mess. To save the bulb it must be cleaned and replanted, with the anaerobic condition in the moss and the disturbance in cleaning and repotting the bulb suffers tremendously. Composts and manures are some of the poorest materials to use because they rapidly decompose into ''jelly-like'' anaerobic masses which destroy roots rapidly. Other than environment, the organics are regarded as sources of nutrition for the plant. This is a fallacy because they contain very little nutrition, release it too slowly, and do not give the grower any control. It is much easier to add the requirements to the water. The answer would seem to be in reducing the quantity of organic material to a low value. In this manner the mix would remain more constant over a long period of time, obviating disturbance of plant for several years.

Although ''Dutch hybrids'' can be grown in pure peat and many other mixes, in plastic pots and clay, I believe that using mixes that require the least care are best. After trying a couple dozen types, the following became a standard:

2 parts organic (fibrous)
3 parts sponge-rok #3 (coarse)
2 parts fine sand
1 part charcoal #10 (10 mesh)
2 parts vermiculite #3

Superphosphate and lime should be added in the amount of 2½# of each per yard (equal to about ½ teaspoon per 6″ pot). If very acid organics are used like sphagnum peat or redwood sawdust, a little more lime will be required to bring the pH into the 6-7 zone. One person told me he used a handful of lime per 6″ pot. This would undoubtedly be a very bad practice, because with such an excess of lime, the phosphorus, boron, iron and molybdenum would be ''locked out''.

Bulbs should not be overpotted. The pot size used should be such that the plant will use the moisture in 2-3 days; otherwise they will not prosper because they stay wet too long. Clay pots, because they disburse the excess moisture by evaporation, suffer the disadvantage of cooling the soil 8°-10°. If one is careful in watering and uses a very porus mix, the lack of cooling would make a plastic pot much better than clay.

4. LIGHT REQUIREMENTS

One will see pots crowded together in most glasshouses, and often with several offsets in the pot. All of these plants are a mass of leaves and none get enough light. The owner complains of poor bloom. To receive sufficient light, pots should be spaced so all leaves are well exposed to the light and small statured plants should not be shaded by large statured plants. Big plants like *A. parodii* require 300 sq. ins. while *A. anzaldoi* would only require 75 sq. inches; the ''Dutch hybrids'' need at least 100 sq. inches. Offsets should be continually removed or additional space should be allowed so plants get light. The glass in the greenhouse should be scrubbed a couple times a year. Old glass should be sprayed with an etchant to clear it up. Fibreglass houses should be thoroughly cleaned of all glass fibre and dirt and recoated per manufacturer's instructions about every two years.

Only a slight shading can be used in the few weeks of hot weather. The glass should be hosed off every week to remove the dust accumulation. Spring and fall months are critical because they receive only about ½ the gram-calories as mid summer. The same latitude as Chicago receives over 500 gram-calories per day in June, 200 in March, 260 in September, 29 in January. Note that the amount of light in January is ONLY 1/17th of that in June. Also remember that the bulk of the species grow between latitudes 10°S. and 20°S., and many at high altitudes. These areas are noted for their brilliant light. Although no gram-calorie counts are available, other indicators suggest values double those in the U:S. and winter brilliance is not diminished as in the U.S.

5. VERNALIZATION—REST PERIOD

With the exception of 2 or 3, the species are forced into some kind of vernalization in their native habitat. This is usually referred to as the so-called *rest period.* Several will stay green through the winter and grow well the second season, then if not forced into dormancy, will go into decline and the bulb is lost. My experiences have been ''bitter medicine''. I believe ALL amaryllis should be vernalized every year. Dutch hybrids handle easily—just withhold water for a month or two then moisten until new leaf growth is well started. If the greenhouse is cool and damp, re-moistening might not be necessary for several weeks.

Although they have a period when they do not grow *A. blumenavia* and *A. calyptrata* seem to require moisture throughout the year. I have been successful with growing *A. blumenavia* only in fine sand. Three bulbs in a 4″ pot will bloom every couple of weeks for several months. *A. calyptrata* requires a very porous mix—4 parts coarse sponge-rok, 2 parts coarse redwood sawdust, 1 part 10 mesh charcoal, 1 part vermiculite —has grown good plants. There should be enough lime to neutralize the sawdust. This plant is often found growing epiphytically.

A. aulica, bellanonna, blossfeldiae, ferreyrae, miniata, papilio, reginae, and *striata* need 1 or 2 months of rest. *A aulica* is often found as an epiphytic plant and in a cool moist area. *A. papilio,* which is just another form of *A. aulica,* needs the same treatment. *A. belladonna, ferreyrae, miniata* and *A. reginae* are from warm, humid areas.

A. caupolicanense, divijulianus, escobaruriae, forgetii (Bolivian form), *fragrantissima, lapasense, leopoldii, nelsonii, pardina, pseudopardina, vittata,* and *yungacensis* are Bolivian plants found at altitudes from 2000, to 6000′ where the dry season last for a couple months, then there is rain nearly every night during spring. They grow on slopes, lightly shaded by forest in a duff 1-2 inches thich, with roots barely covered and extending three feet or more from the bulb. In pots these species seem to need at least two months rest. Most will lose only a part of their leaves before blooming, then will give a ''flush'' of new leaves before the remaining leaves are lost.

A. corriensis, elegans, flammigera, moreliana, psittacina, starkii, traubii, rubrapicta, doraniae, mandonii, and *aglaiae* also need two months or more of rest. This group grows at low altitudes, except *mandonii.* All but *A. flammigera, starkii,* and *mandonii*, grow in humid, warm conditions. *A. flammigera* grows at 6000′-7000′ altitudes in cool, moist areas. *A. starkii* is from a desert area with a lengthy dry season. *A. mandonii* comes from about 10,000′ elevation with mild conditions. *A. doraniae* comes from a hot, humid, rainy area but goes dormant for 2-3 months in the winter. It is possible it gets too cold for it in California. It seems to prefer small pots and never makes big bulbs. *A. aglaiae* comes up in the spring, blooms, the leaves die back completely, then in 4-6 weeks it grows another flush of leaves which stay on for about 4 months. It stays dormant for 3 months. It always does this both in the greenhouse and outside.

A. anzaldoi, cybister, evansiae, fosteri, fusca, mollevillquensis petiolata need 3 months or more rest. *A. anzaldoi* from east of Laganilles is found at slightly higher altitude than *evansiae* and in drier conditions. Both should have water withheld completely from late November till after bloom and new leaves are well started. *A. cybister* is from 7000-8000′ altitude where there is about 15 inches of rain in early spring, then none the rest of the year. It grows on rocky hillsides amongst cactus. *A. forteri* comes from hot, deserty area with probably 15 inches of rain in spring and a long season of completely free of rain. *A. fusca* is from 8000′ alt. My experience with this is insufficient to be specific. *A. mollevillquensis,* from a very dry area, grows in the steep canyon walls where moisture is retained for a greater length of time than the surrounding hillsides. When it grows leaves, water it; the rest of the time let it be dry. *A. petiolata* is nearly evergreen but needs to be left dry for a long time. A rule of thumb that works well for *A. cybister, fosteri, fusca,* and *mollevillquensis,* is when leaves get a good start, water. When leaves start to die back quit, and give no water until growth resumes. ''Benlate'' drenches once a month at 500 ppM seems to benefit them.

A. ambigua, immaculata, tucumana, parodii, need 4 months rest. *A. parodii, immaculata,* and *tucumana* will have normal appearing leaves for several weeks after watering has stopped, then will die back completely. When watered in early March the leaves pop out and are often 6″ long in a week. From an early March watering they bloom the last of May and in June. These bulbs occur in very rocky soil. *A. parodii* is from altitudes of about 2000 ft. in a hot, desert like area with rain only in late spring and early summer; while *A. immaculata* is found at altitudes of 4500-7000 feet. *A. tucumana* occurs at a lower altitude than *A. parodii* in hot, dry conditions. It is much hardier than *A. immaculata* and requires more severe conditions. *A. ambigua* is a hesitant starter and seems to benefit from a hot, dry baking during its rest period. Day periods of 90-95° F. seem to complete its vernalization. It should not be watered until 2-3 leaves are an inch high, then increase the moisture when it starts to grow. It doesn't bloom if not throughly dried out and given a long rest.

My experience does not allow much comment on several species. *A. angustifolia* seems to like more watering and wetter soil than most, but has a definite cycle and would appear to need a dry winter time. *A. reticulata* needs watering the year round with a late spring time of drier conditions. Bloom is usually in August or September. *A. ararapina* needs a long rest. *A. iguazuana* goes completely dormant and grows on near vertical cliffs in deposits of heavy soil but grows in the greenhouse about like most others. *A. kromeri* grows on top of low mountain peaks with bulbs deep in the clay soil. In the greenhouse it appears to want a couple months rest. *A. macbridei* occurs in a harsh hot area of long drought. I water it when in leaf and stop completely when it shows any sign of growth stoppage. So far it has taken long rests and doesn't seem to adjust to North American time. *A. viridiflora* grows like *macbridei*—when it feels like it—occurs in hot, humid, high rainfall area.

In conclusion, the author wishes to qualify all statements in this article with the hope that the conclusions are correct and hopes that it will promote further experimentation and develop better growing methods.

MOSAIC DISEASE IN LEOPOLDII **AMARYLLIS** HYBRIDS

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SUMMARY

A mosaic disease of **Amaryllis** was investigated by electron microscopic examination of leaf sections and negatively stained crude sap. Numerous inclusion bodies were detected in thin sections, and virus particles were observed in both thin sections and crude sap. The inclusion bodies and virus particles were not present in the dark green areas of the mosaic tissue. Virus particles were between 5500 and 8000 A in length and 120 A in width.

The virus was transmitted to **Gomphrena globosa** and **Chenopodium quinoa** and produced local lesions in 7-10 days.

INTRODUCTION

Numerous authors have observed, investigated, and periodically brought up various aspects of the virus problems of *Amaryllis* (Dickson 1922, Hannibal 1942; Iwaki 1967, Johnson 1951, Kahn 1960, Kahn and Scott 1964, Kahn and Smith 1963, Procenko and Procenko 1962, Stauffer 1963, Townsend 1935; Traub 1958).

Inclusion bodies associated with a mosaic disease of *Amaryllis* were investigated and described by McKinney et al. (1923), Holmes (1928), Brierley (1948), Brants (1965) and Baur and Halliwell (1970).

Amaryllis mosaic is prevalent in the Baton Rouge area of Louisiana and is characterized by light yellow-green discoloration and dark-green spots on young leaves. These leaves develop yellowish striped patterns as they mature.

An investigation was undertaken to detect and identify the casual agent of this mosaic disease.

MATERIALS AND METHODS

Plants of *Amaryllis* gh. *leopoldaeoides,* Traub, commonly known as Leopoldii hybrids, with distinct mosaic symptoms were employed throughout the investigation.

A. ELECTRON MICROSCOPY. A direct negative straining method for rapid detection of virus particles in fresh preparations from infected plant tissue was used (Hitchborn and Hills 1965, Doi et al. 1969).

Thin sections from diseased and symptomless leaves were cut on a LKB ultra-microtome after fixation in 3% gluteraldehyde and osmium tetroxide. The sections were stained with uranyl acetate and lead citrate.

B. HOST RANGE. The following plant species were mechanically inoculated with sap expressed from mosaic diseased leaves, using 0.025M phosphate buffer (pH 7.2) and 600 mesh carborundum: *Capsicum frutescens, Capsicum annum, Cucumis sativus* cv. 'National Pickling', *Chenopodium quinoa, Cucurbita pepo, Gomphrena globosa, Nicotiana glutinosa, Nicotiana tabacum* var. Samsun, var. Gold Dollar, var. N.C. 95, var. Barley 21, var. Havana 425, *Petunia hybrida, Phaseolus vulgaris, Sorghum halpense, Sorghum vulgare, Saccharum* sp., *Vigna sinensis, zea mays.*

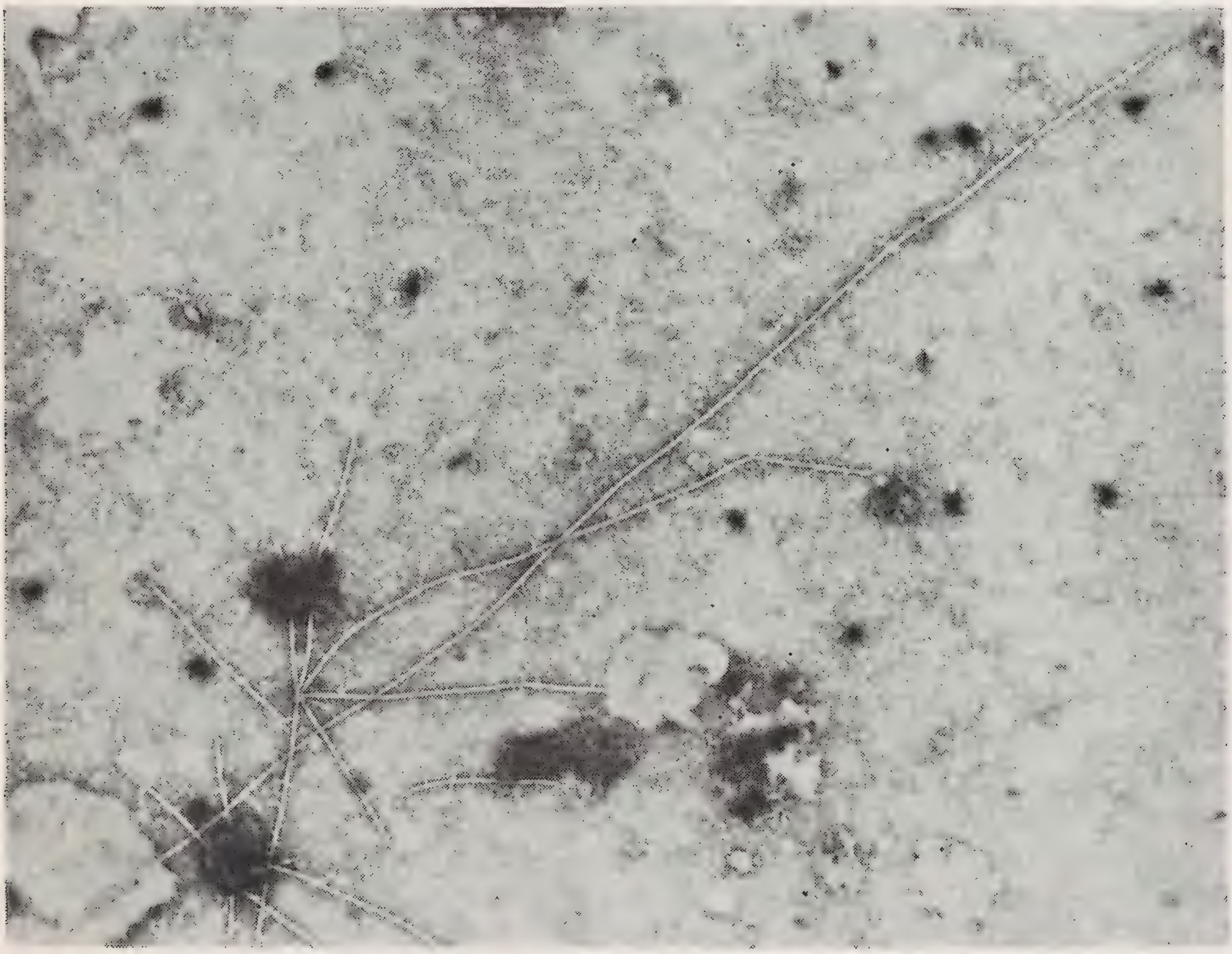

Fig. 28. **Amaryllis** mosaic disease. Negatively stained HMV particles in crude sap of **Amaryllis.** X 2800.

Aphid transmission was attempted using *Schizaphis graminum* and *Myzus persica* with feeding time ranging from 30 minutes to 24 hours.

RESULTS

Long flexuose particles were revealed under the electron microscope in negatively stained sap. The majority of these were between 5500 and 8000 A in length and 120 A in width. These were comparable to the particles described by Brants (1965), Iwaki (1967), Procenko and Procenko (1962) and resemble virus particles observed by Johnson (1951). (see fig. 28.)

Thin sections contained similar virus particles which were present in the cytoplasm of epidermal cells. Fan-shaped to pinwheel-shaped inclusion bodies, similar to those described by Edwardson, et al. (1968), Fujisawa, et al. (1967), Arnott and Smith (1967), and Baur, et al. (1970) were also found in the cytoplasm. The occurrence of large numbers of vesicles in the cytoplasm was considered characteristic of infected tissue. No distinct changes were observed in the nucleus, chloroplasts, or mitochondria of virus containing cells as compared with thin sections from a symptomless leaf tissue, where no virus particles or inclusion bodies were detected. (See Figs. 29 and 30).

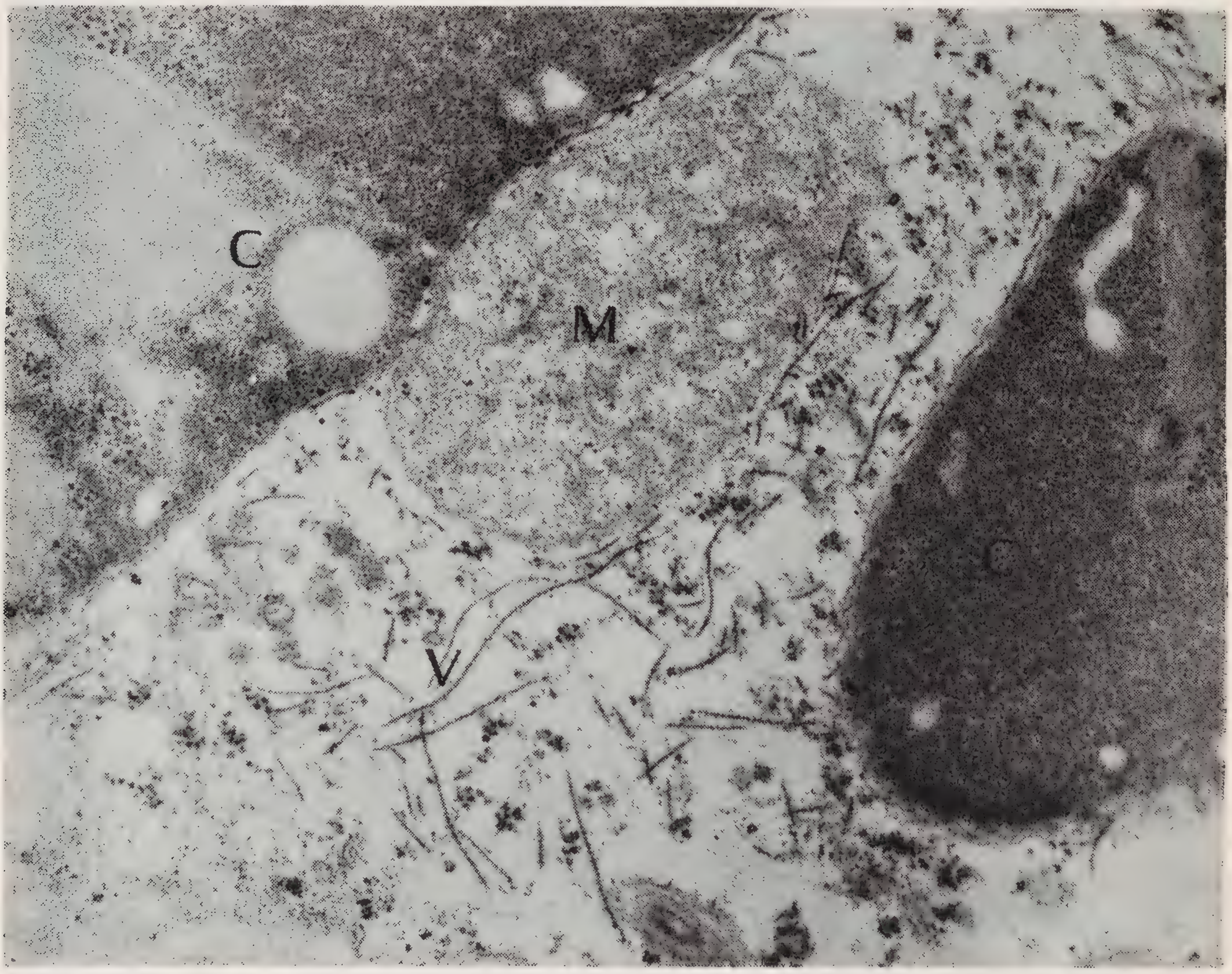

Fig. 29. **Amaryllis** mosaic disease. Thin section of leaf epidermis (light strip): **C,** chloroplast; **M,** mitrochondrion, and **V,** HMV particles. X 34,200.

In host range studies only *Gomphrena globosa* and *Chenopodium quinoa* proved to be good local lesion hosts. Both plant species developed numerous local lesions in 7-10 days after inoculation with virus-containing sap with no subsequent systemic infection.

The virus, due to its similarity to that described by the above cited authors, may be regarded as Hippeastrum mosaic virus.

At present, work is continuing toward obtaining highly purified virus preparations for development of antiserum. Further investigations of physical properties of the virus are also under study.

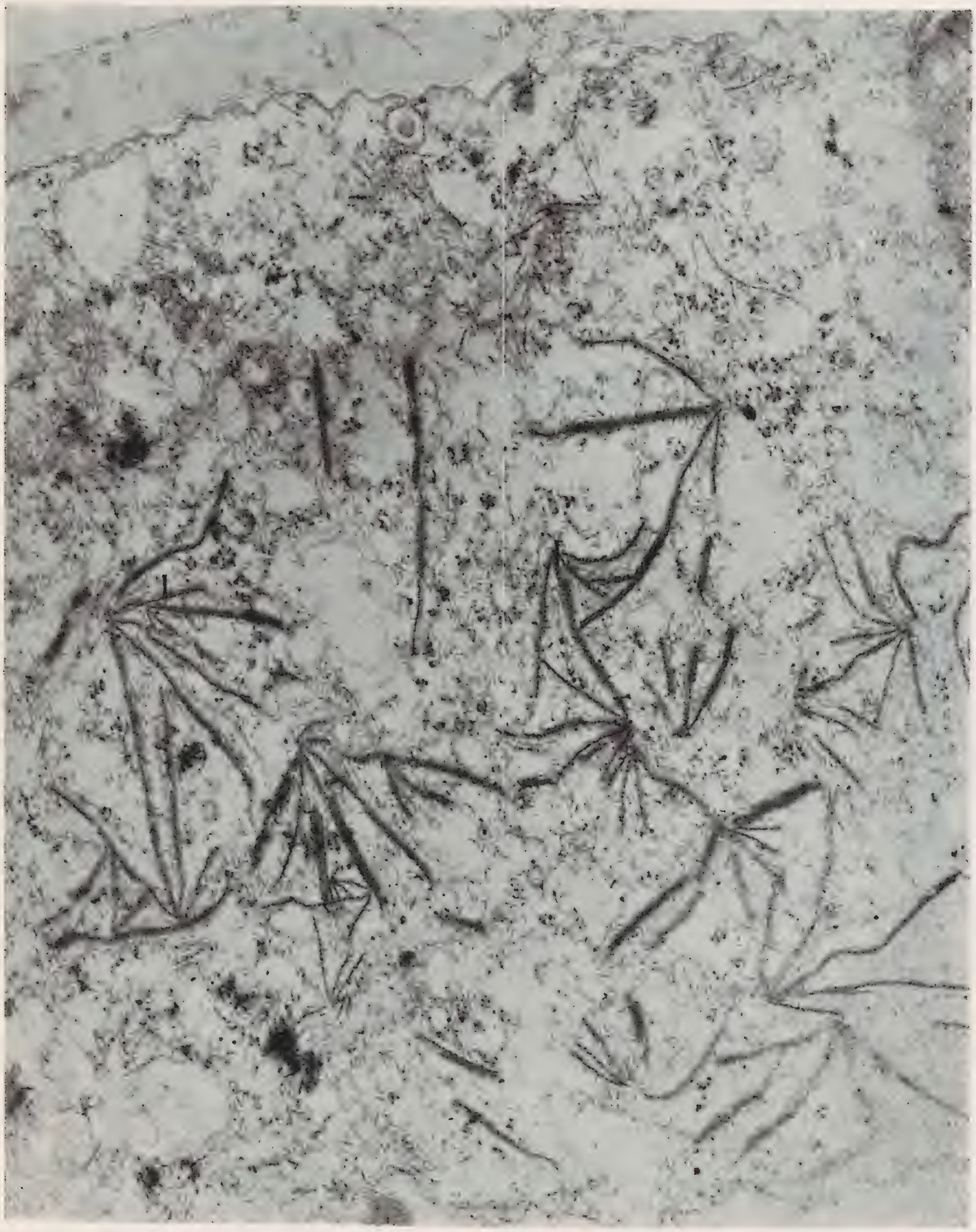

Fig. 30. **Amaryllis** mosaic disease. Numerous inclusion bodies visible in thin section of epidermis of mosaic infested (light green strips). **I**, inclusion body; X 33,990.

ACKNOWLEDGMENTS

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REFERENCES

Arnott, H. J. and K. M. Smith. 1967. Electron microscopy of virus-infected sunflower leaves. J. Ultra. Res. 19:173-195.

Baur, P. S., R. S. Halliwell, 1970, Electron Microscopy of Hippeastrum mosaic virus. Proc. 67th Ann. Convention Southern Agric. Workers, Inc. (Abstr.).

Brants, D. H. and J. van der Heuvel. 1965. Investigation of Hippeastrum mosaic virus in Hippeastrum hybridum. Neth. J. Plant Path. 71:145-151.

Brierley, P. 1948. Diseases of Amaryllidaceas, excluding those of Allium and Narcissus. Herbertia 15:113-120.

Brunt, A. A. 1970. Narcissus. Glasshouse Crops Res. Inst. Ann. Rep. 151-152.

Delgado-Sanchez, S. and R. G. Grogan. 1966. Purification and properties of Potato virus Y. Phytopathology. 56:1397-1404.

Dickson, B. T., 1922. Studies concerning mosaic diseases. Techn. Bull. MacDonald Coll. McGill Univ. No. 2.

Doi, Y., S. Toriyama, K. Yora and H. Asuyama. 1969. Direct negative staining method for detection of virus particles in fresh preparations from infected plant tissues. Ann. Phytopath. Soc. Japan 35:180-187.

Edwardson, J. R. 1966. Electron microscopy of cytoplasmic inclusions in cells infected with rod-shaped viruses. Amer. J. Bot. 53(4):359-364.

——, D. E. Purcifull, and R. G. Christie. 1968. Structure of cytoplasmic inclusions in plants infected with rod-shaped viruses. Virology 34:250-263.

Fujisawa, I., T. Hayashi, and C. Matsui. 1967. Electron microscopy of mixed infections with two plant viruses. I. Intracellular interactions between Tobacco mosaic virus and Tobacco etch virus. Virology 33:70-76.

Gilaspie, A. G. 1971. Sugarcane mosaic virus: Purification. **In:** M. T. Henderson (ed.) Int. Soc. Sugarcane Technol. 14th Congr. Proc. 14:961-970.

Gooding, G. V. and Q. W. Bing. 1970. Serological identification of Potato virus Y and Tobacco etch virus using immunodiffusion plates containing sodium dodecyl sulfate. (Abstr.) Phytopathology 60:1293.

Hannibal, L. S. 1942. Mosaic virus in the Amaryllids. Herbertia 9:143-150.

Hitchborn, J. H. and G. J. Hills. 1965. Electron microscopic examination of wild Cucumber mosaic virus in negatively stained crude preparations. Virology 26:756-758.

Holmes, F. O. 1928. Cytological study of the intracellular body characteristic of Hippeastrum mosaic. Bot. Gaz. 86:50-58.

Iwaki, M. 1967. Viruses causing mosaic diseases of Amaryllis in Japan. Ann. Phytopath. Soc. Japan 33:237-243.

Johnson, J. 1951. Virus particles in various plant species and tissues. Phytopathology. 51:78-93.

Kahn, R. P. 1968. Amaryllis virus research 1960-1967. Plant Life, The Amaryllis Yearbook. pp. 9-12.

——. 1960. The present status of the Amaryllis mosaic disease in the United States. Louisiana Soc. Hort. Res. Bull. No. 5:24-30.

—— and H. A. Scott. 1964. Serological relationship of cucumber mosaic virus and certain virus isolates that incite Amaryllis mosaic symptoms. Phytopathology 54:360-362.

—— and F. F. Smith. 1963. Transmission if virus inciting Amaryllis mosaic symptoms. Plant Life, the Amaryllis Yearbook. pp. 133-143.

McKinney, H. H., S. H. Eckerson and R. W. Webb. 1923. Intracellular bodies associated with a "Mosaic" of Hippeastrum johnsonii. Phytopathology 13:41-42.

Procenko, A. E. and E. P. Procenko. 1962. Some new virus diseases of ornamental plants. **In:** Proc. 5th Conf. Czechosl. Pl. Virologists. Prague. pp. 241-245.

Sciumbato, G. L. 1973. Studies on the viruses infecting pepper (Capsicum sp.) in Louisiana. Dissertation. Louisiana State University.

Stouffer, R. F. 1963. A mosaic disease of hybrid Amaryllis caused by Cucumber mosaic virus. Fla. State Hort. Sco. Proc. 76:462-466.

Townsend, G. R., 1935. Amaryllis mosaic. Fla. Agric. Exp. Sta. Annual Rep. pp. 129-130.

Traub, H. P. 1958. The Amaryllis Manual. The Macmillan Co., New York.

ON THE ELIMINATION OF AMARYLLIS MOSAIC VIRUS FROM LEOPOLDII AMARYLLIS HYBRIDS: PART I. SHOOT-APEX CULTURE

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SUMMARY

A two-stage method of aseptic shoot-apex culture of **Amaryllis gh. leopoldaeoides, Traub** [Leopoldii Hybrids] **cv. Wedding Bells** was employed in an attempt to recover virus-free plant material from virus infected bulbs.

Bulb cuttage was a source of shoot-apices which subsequently were cultured on liquid nutrient medium in tubes 25 x 150 mm size at a temperature c. 25° C., and light intensity of 1,000 ft. candles.

INTRODUCTION

Amaryllis hybrids grown in Louisiana and other Gulf States frequently show mosaic in the leaves. The symptoms are known to be caused by one of three viruses (Kahn 1968).

1. Amaryllis (syn. Hippeastrum) mosaic virus (HMV)
2. Tomato spotted wilt virus (TSWV)
3. Cucumber mosaic virus (CMV)

The mosaic developing in leaves of hybrids of Amaryllis impedes greatly any attempt to develop commercial bulb plantations in the Southern U.S., and brings about many disappointments to Amaryllis hobbyists.

Holmes (1965) expressed belief that it may be possible to obtain virus-free subclones from mosaic infected bulbs of *Hippeastrum.*

From other bulbs, virus-free plant material was produced from virus diseased freesia (Brants et al. 1965; McWhirter 1971), iris "Wedgwood" (Baruch and Quak 1966), dahlia (Morel and Martin

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* This work is part of a project being conducted as partial fulfillment of requirements for the Ph.D. degree.

1952), and *Narcissus tazetta cv. Grand Soleil d'Or* (Stone 1973).

Also Brierley (1963) found up to 98 percent virus-free gladiolus cormels from an infected clone he studied, and that scale propagation of *Lilium longiflorum* eliminated fleck symptoms.

This paper gives details of a relatively simple method of rapid propagation of Amaryllis clones which serves as a source of shoot-apices, and of culturing these on liquid medium.

The method described here may serve as a rapid means of multiplication of virus-free bulbs.

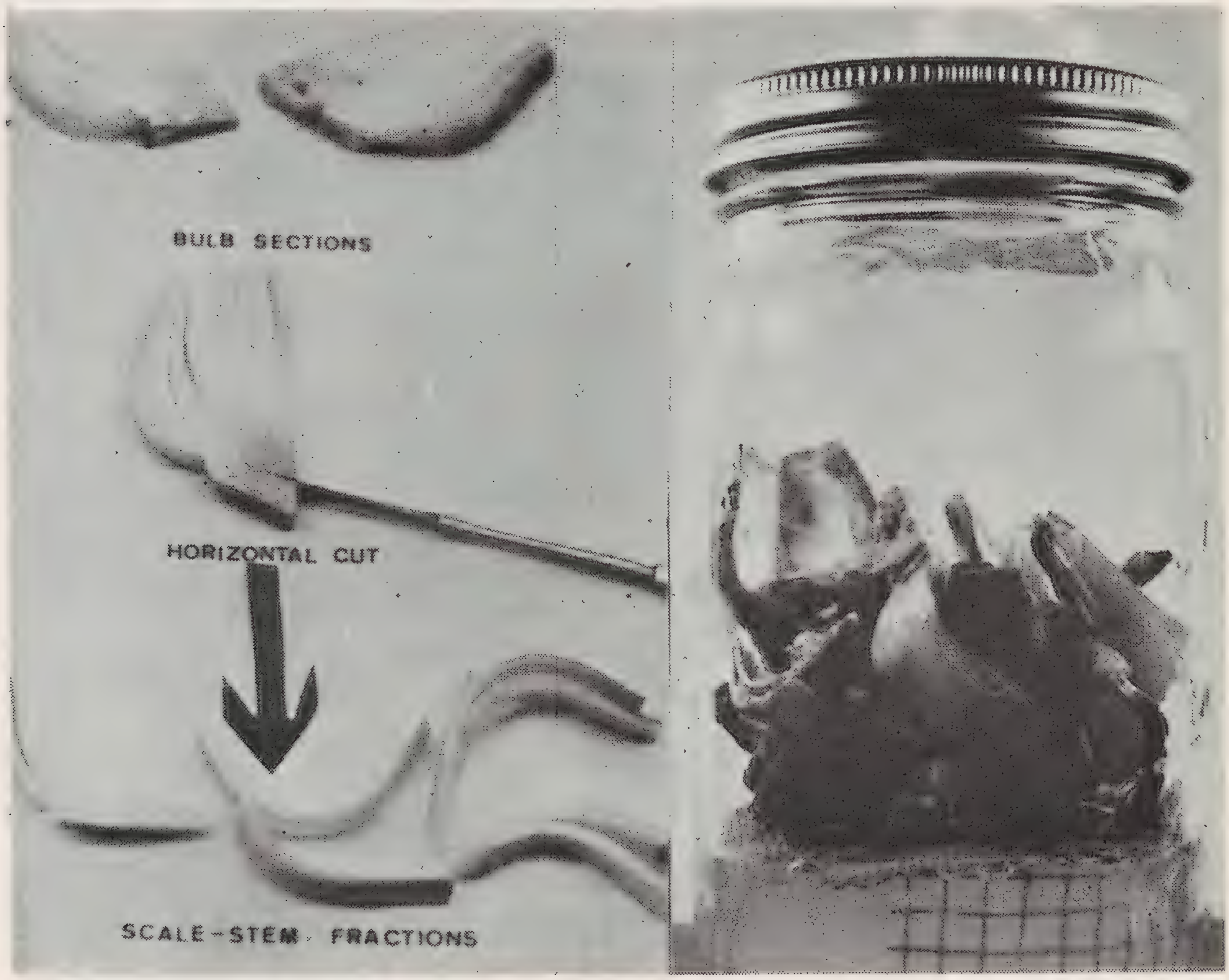

Fig. 31. Shoot-apex production of mosaic virus infested **Amaryllis: Left,** fractional scale-stem cuttage; **Right,** fruit jar with fractional scale-stem cuttings.

MATERIALS AND METHODS

Amaryllis bulbs with mosaic diseased leaves were obtained from the Baton Rouge area and checked for the presence of Hippeastrum mosaic virus-like particles under RCA type EMU-36 electron microscope, using a quick leaf-dip method (Hitchborn and Hills 1965, Doi et al. 1969).

The bulbs were washed, stripped of leaves and outer dry scales, bathed in Benomyl (1 tbsp./gal.) for 1 hour and left to dry in a sterile container.

In the next step, the bulbs were cut completely into eight or more sectors about 10 mm wide at the circumference (Traub, 1933, 1934, 1935, 1958; Everett, 1954; Yusof 1971). Each sector was then chipped into pieces consisting of 2-3 bulb scales with a portion of basal plate attached (the 'fractional scale-stem cuttage' of Traub 1958), (See Fig. 31.)

A. SHOOT-APEX PRODUCTION

The bulb "chips" were placed in Benomyl for 10 minutes and into one-quart fruit jars containing about three centimeters of water with a hardware cloth framework serving as a support for bulb chips above the water level.

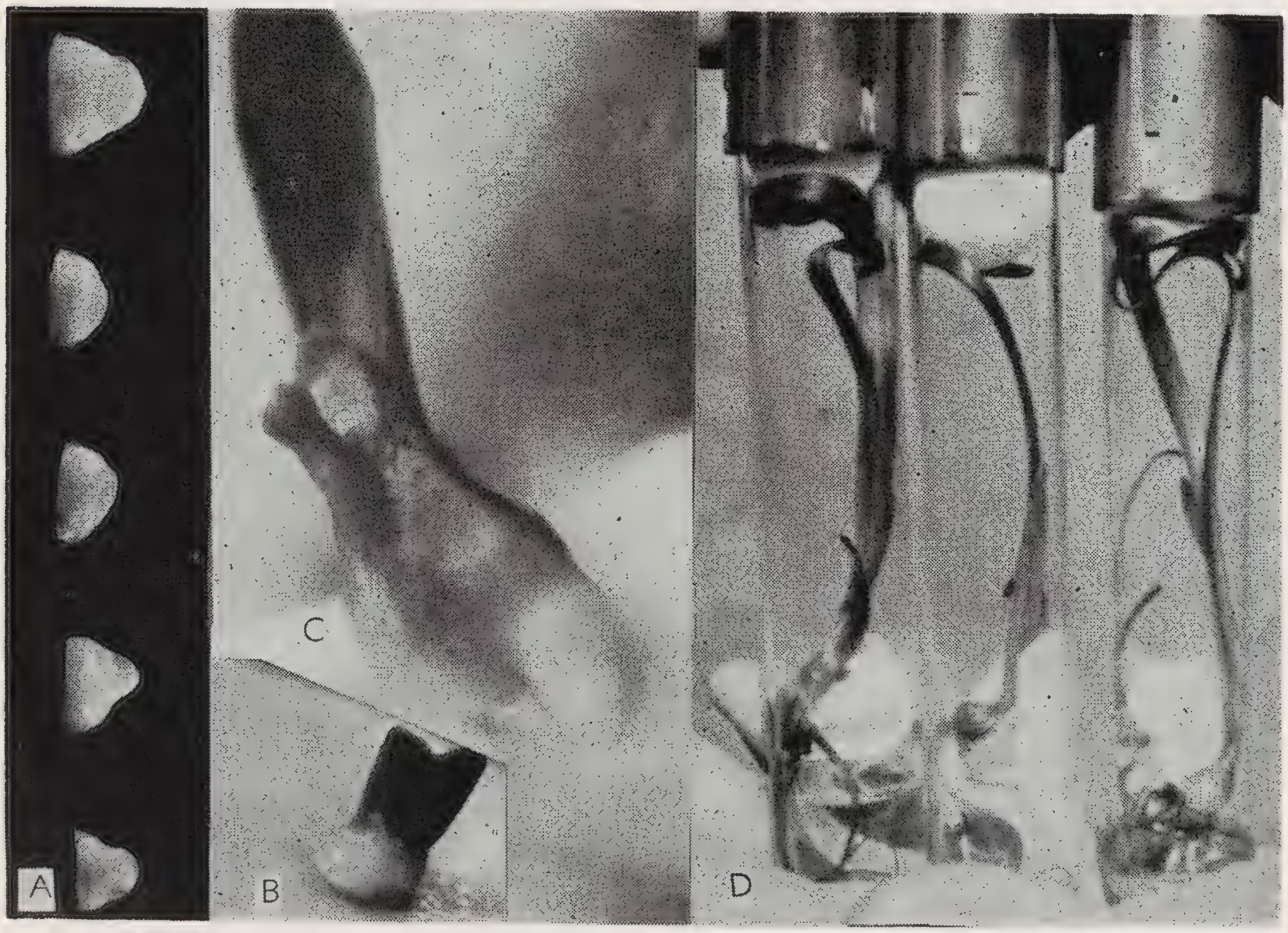

Fig. 32. Shoot-apex culture of mosaic virus infested **Amaryllis: A,** excised shoot-apices, X 3.9; **B**, explant, a characteristic swollen base, 8th day from excising, X 3.3; **C**, after 4 weeks of culture, X 3.3; and **D**, plantlets in 7th week from excising.

The chips were placed on a filter paper which, in the later experiments, was replaced by plastic screen-mesh. (See Fig. 31.)

The jar was closed with a metal screw-cap with a small hole in the middle plugged with a ball of non-absorbent cotton to allow some gas exchange and possible reduction of chance of fermentation of the chips. Thus, the jar atmosphere was kept saturated with water.

The temperature outside the jars was maintained at c. 25-28° C., and light of about 1,000 ft. candles, provided with a mixture of 'Cool White' and 'Gro-Lux' florescent tubes. (1:1)

Where some decay developed, chips were placed in a fresh jar after removal of decaying parts and Benomyl treatment.

Formation of shoot-apices in the form of small bulblets between scale axils was initiated in about 2 to 3 weeks time (Yusof 1971).

B. SHOOT-APEX CULTURE

Upon formation of shoot-apices, these together with parts of basal places were excised and surface sterilized by immersing them for 10 minutes in 0.5 percent water solution of calcium hypochlorite containing a wetting agent, then rinsed three times with autoclaved water.

Table 1. Nutrient medium composition for formation of plantlets from shoot apex explants of **Amaryllis:**

Ingredients	**Mg/1 medium**
Inorganic constituents	
NH_4NO_3	1,650.0
KNO_3	1,900.0
$CaC1_2.2H_2O$	440.0
$Mg\ So_4.7H_2O$	370.0
KH_2PO_4	170.0
Na_2EDTA	37.3
$FeSO_47H_2O$	27.8
H_3BO_3	6.2
$MnSO_4.4H_2O$	22.3
$ZnSO_4.4H_2O$	8.6
KI	0.83
$Na_2MoO_4.2H_2O$	0.25
$CuSO_4.5H_2O$	0.025
$CoC1_2./6H_2O$	0.025
Organic constituents	
NAA	0.3
Kinetin	0.1
Thiamin.HC1	1.0
Pyridoxin.HC1	5.0
Nicotinic acid	5.0
Myo-Inositol	100.0
Adenine sulfate.dihydrate	40.0
Sucrose	25,000.0
Other supplements	
Difco Bacto malt extract	500.0
$NaH_2PO_4.H_2O$	170.0
Difco Bacto agar	6,000.0

Subsequently, shoot-apices ranging in size from 1-3 mm diameter were excised in a Microvoid type transfer-case and placed on a filter-paper bridge in tubes (Pyrex 25 x 150 mm) containing 10 ml of the liquid nutrient medium. (see Fig. 32.)

The medium was identical to that of Murashige et al. (1972) used for propagation of asparagus shoot-apex culture.

The cultures were placed under 1,000 ft. candles of light supplied by 'Cool White' and 'Gro Lux Light' 1:1, and at a temperature of c. 25° C.

RESULTS

The survival of explants ranged between 30 and 70 percent depending on size of shoot-apices. There was a higher tendency to survival in a larger shoot apices.

The first signs of root initiation followed a swelling of the base of the explant which was observed at the 8th day; however, rapid leaf elongation in most cases was observed after transfer to fresh medium at the 4th week from excising. Fig. 32.

After three more weeks plantlets at various stages of development, with formed roots and leaves, were transferred to a plastic container and planted in vermiculite drenched with No. 2 Hoagland solution and covered to maintain high humidity.

The plantlets cultured this way developed bulbs up to 8 mm on cross-section and were further transferred in their 5th month of culture to 3″ clay pots with medium consisting of sand vermiculite 2:1 and watered with No. 2 Hoagland solution.

It was also experienced that plantlets with an initial leaf development (5-10 mm long) and only a swollen base can be transferred to vermiculite and expected to root and grow in about 75% of the cases.

From 115 obtained plants, 103 show no mosaic pattern in the leaves and after 7 months of growth in pots no virus particles were detected under electron microscope; however, before further work with test plants will be completed, no concluding remarks can be drawn.

Work now in progress involves heat treatment, transmission and observation of known indicator plants and attempts to develop antiserum for HMV aimed at rapid separation of virus diseased plants from healthy ones.

REFERENCES

1. Baruch, E. R., and F. Quak. 1966. Virus-free plants of iris 'Wedgwood' obtained by meristem culture. Neth. J. Pl. Path. 72:270-273.

2. Brants, D. H. and M. Vermeulen. 1965. Production of virus-free freesia's by means of meristem culture. Neth. J. Pl. Path. 71:25-27.

3. Brierley, P. 1962. Easter lilies freed from cucumber mosaic virus by scale propagation. Pl. Disease Reptr. 46(9):627.

4. ——. 1963. Gladiolus cormels free from cucumber mosaic virus from infected parent corms. Pl. Disease Reptr. 47(10):863.

5. Doi, Y., S. Torijama, K. Yora, and H. Asuyama. 1969. Direct negative staining method for detection of virus particles in fresh preparations from infected plant tissues. Ann. Phytopath. Soc. Japan 35:180-187.

6. Everett, T. H. 1954. The American Gardener's Book of Bulbs. Random House, Inc., New York.

7. Hitchborn, J. H. and G. J. Hills. 1965. Electron microscopic examination wild cucumber mosaic virus in negatively stained crude preparations. Virology 26:756:758.

8. Hollings, M. and O. M. Stone. 1968. Techniques and problems in the production of virus-tested planting material. Soc. Hort. 20:57-72.

9. Holmes, F. O. 1965. Elimination of mosaic disease from a clone of

Hippeastrum. (Abstr.) Phytopath. 55:504.

10. Yusof, I.B.M. 1971. Vegetative propagation of Amaryllis (Amaryllis gh. leopoldaeoides, Traub). Dissertation. Louisiana State University.

11. Kahn, R. P. 1968. Amaryllis virus research 1960-1968. Plant Life, The Amaryllis Yearbook:9-12.

12. McWhirter, K., 1971. A simple procedure for obtaining virus-free strains of freesia. J. Hered. 62(1):52-53.

13. Morel, G., and C. Martin. 1952. Guérison de dalias atteints d'une maladie á virus. C. r. hebd. Séanc. Acad. Sci. Paris 235; 1324-1325.

14. Murashige, T., F. Skoog. 1962. A revised medium for rapid growth and bio assays with tobacco tissue culture. Ph. Plant. 15:473-497.

15. Murashige, T., M. N. Shabde, P. M. Hasegawa, F. H. Takatori, and J. B. Jones. 1972. Propagation of asparagus through shoot apex culture. I-nutrient medium for formation of plantlets. J. Amer. Soc. Hort. Sci. 97(2):158-161.

16. Stone, O. M., 1973. The elimination of viruses from Narcissus tazetta cv. Grand soleil d'Or, and rapid multiplication of virus-free clones, Ann. Appl. Biol. 73:45-52.

17. Traub, Hamilton P. 1933. Propagation of Hybrid Amaryllis (Hippeastrum) by Cuttage. Science 78:532.

18. ——. 1934. Experiments in the propagation of Amaryllis by cuttage. Year Book of the American Amaryllis Society (Herbertia) 1: 72-74.

19. ——. 1935. Propagation of Amaryllis by stem cuttage. Year Book of the American Amaryllis Society (Herbertia) 2: 123-126.

20. ——. 1958. The Amaryllis Manual. The Macmillan Co. New York.

HYMENOCALLIS AZTECIANA TRAUB

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From the first moment that the slender petals of each flower flared back, it became evident that this amaryllid was truly an exotic. I wonder if the bulb was known to the Aztecs when their civilization flourished in a vast part of Central America. I do not see how it could have escaped their attention.

The bulb I have of *Hymenocallis azteciana* is rather small, about 1½″ in diameter. This bulb has little or no neck to it and when I received it last summer the plant had already flowered. The four leaves remained until the middle of September, then quickly turned yellow and the plant went dormant. I watered it sparingly and often wondered if the bulb was still alive. It was not until March 28, 1973, that active growth commenced again, after a total dormancy of five and one-half months.

My description of *Hymenocallis azteciana* is from notes taken during the period that it flowered (June, 1973). A pseudo-neck encloses the petioles of the leaves. This sheathing is white to pale green in color and turns papery and brown as the growth matures. The leaves are narrowly elliptical and a medium green although the powdery surface gives them a blue cast. If this bloom is gently rubbed off the normally dull leaves are semi-glossy.

The flower stalk resembles a leaf so much that it was about 8″ tall before I identified it as such. It grew to be 22″ tall, originated from the center of the plant and was terete and twisted somewhat from the base to the flowers.

The lone stalk bore three upright flowers that were at a 60-75° angle to the stalk. As the petals formed they changed from green to a pure white with green markings at the very tips of each petal. The hypanthium (staminal cup) resembles a hoop-skirt with the stamens attached to it. The filaments are white at the base becoming green at the tips where the orange-brown anthers are so delicately fixed. Likewise, the pistil is white at the base and changes to green at the tip (stigma). The first flower opened June 7, the next, June 9 and the last, June 11.

As each flower opens, the intense fragrance of this amaryllid fills the room. The fragrance is lost in a day's time and each flower lasts only 2 days. I wonder if the natural pollinator is a moth as the flowers always opened in the evening and were the most fragrant then. The spider-like form gives the flower its exotic appearance. The name spider-lily certainly seems appropriate.

One of the flowers was pollinated and fertilization occurred. The ovary developed rapidly and on June 14 the capsule split open exposing three seeds (?). According to Traub, *Hymenocallis* have a three-celled capsule that often ruptures prematurely due to the expanding seeds (3). One of the seeds dropped off on June 19, the second, June 24 and the last, June 25. These dark green seeds varied from 15 mm. wide to 18-20 mm. long and were hard and had longitudinal ridges. All three have been planted and remain green (August, 1973) though visable germination has not occurred. Are my seeds actually the cells enclosing the real seed? [Editorial note,—These are true seeds.] I do not know as I have never seen the seed before and must rely on observation and the literature (2,3). Herbert says in reference to the genus, ''The seed of *Ismene* is large and round, and vegetates immediately in a remarkable manner, forming a bulb as big as itself (sometimes much bigger) far under ground without pushing any leaf. As soon as the seed rots, the young bulb must be left without water till the next spring. A person unaware of the peculiarity of this genus and *Choretis,* when he found the seed rotten, would be likely to throw away the earth without suspecting the formation of the bulb near the bottom of the pot.'' (3).

Hymenocallis azteciana responds well to pot culture for me and appears to have less demanding requirements than many other amaryllids. The bulb needs adequate water and occasional applications of soluble fertilizer while in active growth. I expose it to as much sun as possible though this may not be an advisable practice in other geographical locations. Bauml refers to *H. azteciana* as growing in peaty soil in shady spots in its native habitat (1). This species of *Hymenocallis* is not suitable as a display or conservatory ornamental because the flowers are so short-lived. However, it is of interest to the amaryllid enthusiast because to see the flowers unfold quickly, to partake of their heady fragrance and to watch the development of the seed is to witness the rhythm of life itself.

REFERENCES CITED

1. Bauml, J. A. 1972. "A Bulb Collecting Trek Through Mexico" *Plant Life* 28:112-119. La Jolla, Calif.: The American Plant Life Society.

2. Herbert, W. H. 1837. *Amaryllidaceae.* Reprint. New York: Stechert-Hafner Service Agency, Inc. 1970. (224).

3. Traub, H. P. 1963. *The Genera of Amaryllidaceae.* La Jolla, Calif.: The American Plant Life Society. (76).

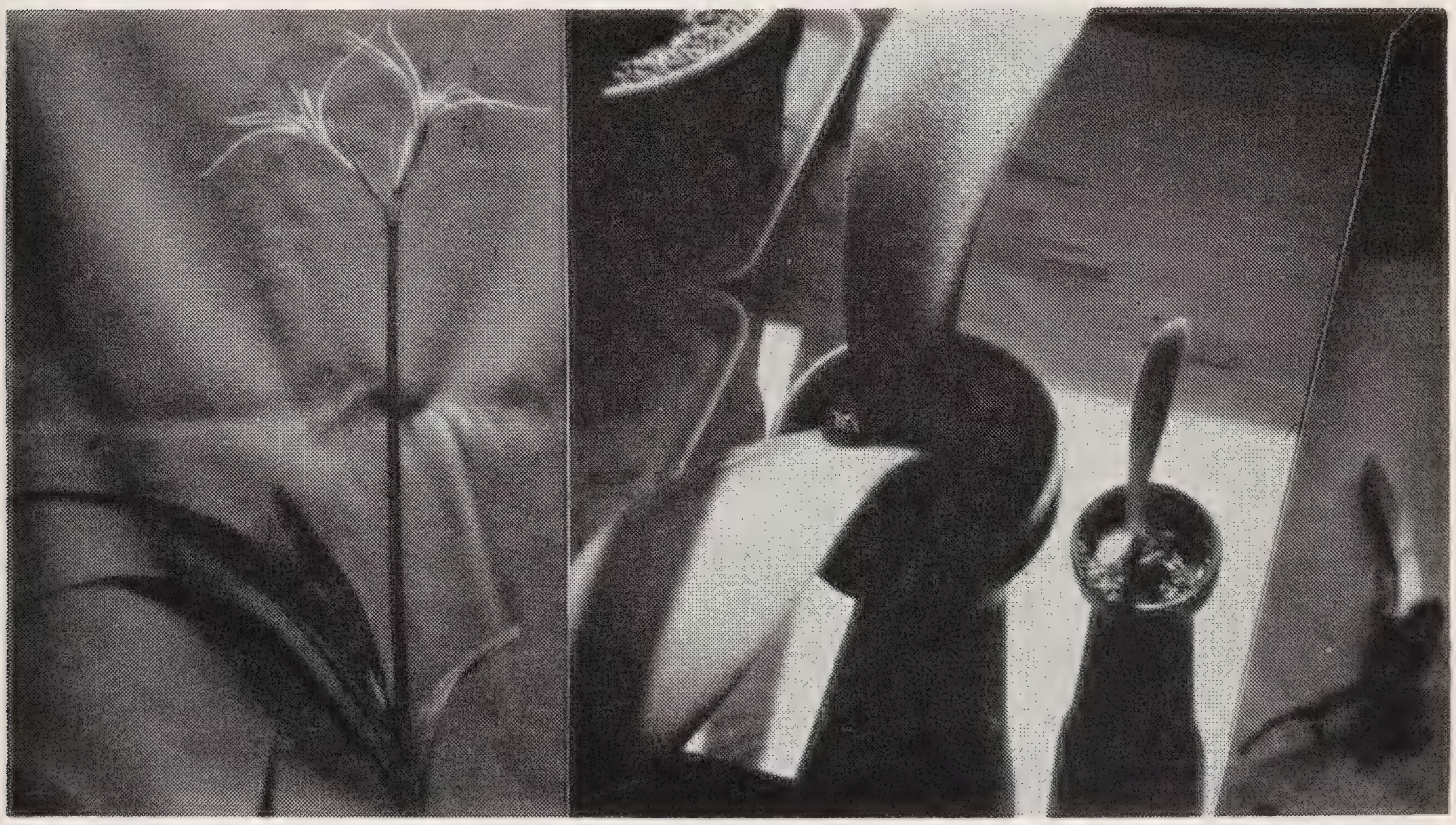

Fig. 33. **Left, Hymenocallis azteciana** Traub in flower June 1973 in Wisconsin.

Right, **Haemanthus hirsutus** Baker, from right to left, bulblet produced from bulb cuttage, young plant from bulb cuttage, and mature plant.

PROPAGATING HAEMANTHUS HIRSUTUS BY CUTTAGE

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Amaryllid enthusiasts are always anxious to learn about new ways of increasing the stock of a rare bulb in their collection. The following method of asexual propagation was used in a seminar course in which I was enrolled at the University of Wisconsin-Madison while earning my B.S. degree in horticulture.

The literature on propagating bulbs asexually dates back to 1933, (*6, 7, 8, 9, 1, 3*). Everett states that his experiments were conducted in August and suggests that work should also be done on bulbs at other times of the year (1).

The propagation method in the sources sounded not only simple but also quite logical. Bulbs are specialized vegetative structures that consist of several bulb scales (which are continuous sheathing leaf bases) and have meristematic tissue in the axils of these scales that can produce miniature bulbs (bulblets). The bulblets derive their nutrients from the parent tissue until they are able to develop their own roots and carry on the same functions as the parent. The bulblet(s) becomes a prized offset that is an exact duplicate of its parent. Thus, if one cuts the mature bulb into pieces the formation of these bulblets should occur, and the stock is increased. This means of propagation is important for increasing species that are slow to produce offsets naturally or to set seed (1).

I had originally chosen to propagate *Urceolina miniata* for my experiment but at the last minute my supplier informed me that he could not obtain the bulbs from the Netherlands. He offered me two bulbs of *Haemanthus hirsutus* instead which I accepted. I must admit that I was loath to try the experiment on such rare bulbs and ended up with a compromise. One bulb would be used for propagation and the other would serve as a ''control.''

The two bulbs were received on March 30, 1972. Everett recommended that the cuttings be placed in a rooting medium of peat moss and sand (perlite) with the tips exposed and bottom heat applied to maintain a temperature 10° F. above the normal temperature for mature bulbs (1). I used a 6:1 mixture of sphagnum moss and perlite and a special tray with a heating coil that the horticulture department had for experimental purposes. The heat at which the tray was designed to operate was 72° F.

My first difficulty occurred in deciding how to cut up the *H. hirsutus* bulb. The bulb was oval shaped and about 3″ in diameter. First the bulb was cut vertically in half (using a sterilized knife), then each piece was cut in half again. Each quarter must contain a portion of the stem (basal plate) as this is the meristematic tissue from which the bulblets will be produced under this technique. Further division is possible by inserting the knife between every 3-4 pairs of concentric scales; however, I could tell at a glance that *H. hirsutus* had so few bulb scales (a total of 4-6) that further division was not possible. So I could obtain only four bulb pieces for my propagation work. The bulb pieces were gently dusted with tersan, a mild fungicide, and placed in the moistened medium.

I departed for Milwaukee for the Easter recess and upon my return two weeks later discovered that the medium had dried out considerably. What was more serious is that the thermostat in the heating tray was malfunctioning and instead of 72° F., was registering 100° F! Needless to say the bulb cuttings were dehydrated but still had some firm tissue. The heating tray was removed and the cuttings were placed in a 1:1:1 mixture of peat, perlite and soil. *Haemanthus* are rather difficult subjects to work with anyway from sources I have read and *H. hirsutus* is no exception (5, 10). Three of the cuttings developed a fungal rot and had to be discarded. On April 26, 1972, I had to report to my seminar group that the experiment to date appeared to be a failure. The ''Amaryllis authority'' as I was fondly called in the horticulture department had struck out.

On or about May 18, I removed the one remaining bulb cutting from the experiment plot to a 2″ pot, placing it in the same medium used in the experiment. I had been chosen to attend the Longwood Gardens Summer Student Program in Kennett Square, Pennsylvania for that summer so my mother was entrusted with *H. hirsutus.* My only instruction was to water the pot occasionally and see what happens. At the time I placed the cutting in the pot the bulb scales were still white and near the base of one of the scales a very minute ''bump'' could be detected. I noticed it and, though curious, was in a hurry to clean up the experiment as the school term was ending and student projects had to be cleaned up and removed from the greenhouses.

In late August when I returned from Pennsylvania my mother informed me that no sign of life had been evident from the ''Blood-Lily'' until the middle of August when a small leaf made its welcome debut. The little bulb was allowed to grow on in the 2″ pot until October when it was transferred to a slightly larger pot. At the date of this article (August, 1973) the small bulb has remained in active growth and measures about ½″ in diameter. How many years it will require to reach maturity is a question that I cannot answer nor can I find such information on this species in the literature.

In conclusion I should like to cite what I have learned about *H. hirsutus* and I invite comments from fellow *Haemanthus* enthusiasts to help in broadening our knowledge of this species. *H. hirsutus* is native to the Transvaal region of South Africa and was first introduced into cultivation (England) by Messrs. Veitch in 1878 (*2,5*). I should describe the bulb as having white scales with a pink or purple tinge. The two leaves are 6″ long and 8″ wide as reported in the literature (*2,5*). The two leaves on my control plant in the experiment measured 9″ long and 3″ wide. The leaves are dark green on the upper sides and paler on the undersides with both sides being pilose, i.e. covered with long, soft, straight hairs, hence the name *hirsutus* meaning ''hairy.'' Martley says the leaves are closely pressed to the ground and the stout flower stalk is hairy with a 3″ umbel of dainty white flowers with golden stamens (4). Weathers claims the flowers may have a pinkish color with red bracts surrounding the umbel (11). Though my bulb has not favored me with flowers, its leaves are most unusual and have caused a good deal of comment from horticulture colleagues as well as other friends who cannot resist touching those lovely fuzzy tongue-like leaves.

LITERATURE CITED

1. Everett, T. H. 1954. *The American Gardener's Book of Bulbs.* New York: Random House.

2. Grey, Charles Hervey. 1938. *Hardy Bulbs.* II: 36-7. London: Williams & Norgate, Ltd.

3. Hartman, H. T. and Kester, D. E. 1968. *Plant Propagation: Principles and Practices.* 2nd Ed. Englewood Cliffs, New Jersey: Prentice-Hall.

4. Martley, John. 1938. "*Haemanthus* Culture in South Africa" *Herbertia* 5: 159. Orlando, Florida: The American Amaryllis Society.

5. "Notes of the Week" 1889. *The Garden* XXXVI: 546. London.

6. Traub, Hamilton P. 1933. Propagation of Hybrid Amaryllis (Hippeastrum) by cuttage. Science 78: 532.

7. ———. 1934. Experiments in the propagation of Amaryllis by Cuttage. Year Book of the American Amaryllis Society (Herbertia) 1: 72-74.

8. ———. 1935. Propagation of Amaryllis by stem cuttage. Year Book of the American Amaryllis Society (Herbertia) 2: 123-125.

9. ———. 1958. The Amaryllis Manual. The Macmillan Co. New York.

10. Van Tubergen, C. G. Jr. 1893. The Garden XLIV. London.

11. Weathers, John. 1911. The Bulb Book. London. John Murray.

REPOTTING THE NERINES OF GREENOAKS

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The NERINES OF GREENOAKS continues to be the major collection of hybrid NERINES in the United States. As it had been three years, and in some cases four years, since the bulbs were last repotted, Mrs. Emma Menninger, owner of GREENOAKS felt that complete repotting during 1973 would benefit the bulbs. We discussed the matter, and I agreed I would be able to assist in the task if our efforts could be organized so that the job would be completed by no later than the end of August.

We reached agreement on our work schedules and began planning strategies during March over a pot of a delicious, delicate tea which Mrs. Menninger had purchased in Darjeeling, India on one of her visits there. The NERINES were still sporting lush, green foliage at this time, but we wanted our work to be well organized. In all, three planning meetings of two-hours duration were held during March and April. As there were in excess of 2,500 potsful of bulbs which had to be reworked, we felt that only by detailing all our plans well in advance could mistakes and unnecessary work be avoided.

Rather than wait until the bulbs went completely dormant during the frequently hot weather of June, we knew it would be to our advantage to enjoy the cooler, mild weather of May for our repotting work. Starting this early would not hurt the bulbs, we felt, nor upset their growth/dormant cycle, as they would be going into dormancy at that time, anyway.

On April 2nd, basic work plans completed, and armed with notebooks, cards, pencils, pens, labels, empty pots, sunglasses, clipboards, small tables, large stools, high hopes, and another pot of that wonderful Darjeeling tea, we set to work at Phase 1, ''Listing and Cataloguing.'' None of this paraphernalia prepared us for the fierce winds which had developed from the morning's gentle breeze while we had been collecting our equipment.

These winds were to last during most of the two days it required to list and catalogue the collection. Their effects made the job uncomfortable at times, while at other times, the work became next to impossible to continue. But continue, we did.

Each pot was first listed by its row number and label information. This list was then taken into the office where Mrs. Menninger made a card on each item. The card file was to be kept as a permanent file record while the list was to be used in the work area as a ''working list'' during the second phase of the operation, ''Repotting.''

A month then passed before the actual work on the bulbs was begun. I took a week's vacation for the bulk of the task. May, usually one of our mild, pleasant months, produced a freak heat wave that week, in which the temperatures rode the high 90's much of the time for the first few days.

As the GREENOAKS Nerines have thrived for over 25 years on the crushed granite soil which forms the property, we felt it wise to continue to use the soil mixture which had been the basis of their previous repottings. This is chiefly the crushed granite soil, much of it pulverized into a dust-like sand, and about one-fourth the volume of oak-leaf mold dug from the bases of a fine stand of oak trees on the grounds. To this ¾ granite soil, ¼ oak-leaf mold mixture, we added enough bone meal to whiten the top (approximately two cupsful per bushel), and, after thorough mixing, potted the bulbs. (There is recent evidence to suggest that the N. sarniensis hybrids may like a soil high in calcium. I am trying a ''sweeter'' soil mixture for a few of the sarniensis hybrids, using crushed oyster shell in the mixture.)

The routine of making the soil mix, getting a flatful of potted bulbs, knocking out the contents of each pot, separating the soil from the bulbs, repotting the largest, setting aside the rest, and taking the repotted bulbs over to the benches for labelling and eventual setting into a permanent position in the growing area, became an automatic function after the first day. Such work has tedium built into it, and many frustrations as well. But it does not have to become boring. There are too many surprises for that.

It came as a surprise, for instance, to learn that the clone 'Rotherside' (H. Chapman) is capable of making such hugh bulbs. And that Mrs. Menninger has so many registered varieties. It was a surprise to learn that certain clones 'Ben Hills' (Exbury) is one example, multiply prodigiously, while certain others seem to have difficulty multiplying at all.

I soon learned that only about 250 potsful of bulbs could be reworked during any one day. After that, the body tires and the spirits flag. Every day at noon, I was given a boost by being treated to a royal lunch prepared by Mrs. Menninger herself, and highlighted by a potful of that memorable tea from India.

The task extended through that first full week and into three weekends beyond. Half-days were necessitated occasionally, due to other demands on the time of each of us.

We finished reworking the last pot on the 26th of May, with eleven days and well in excess of 100 hours of work behind us.

The total number of pots was reduced from over 2500 to just in excess of 1500, making the collection more manageable. The bulbs were repotted into larger pots which will also help contribute to greater ease in their care.

Bulbs, 4,389 in number, ranging in size from large to tiny are being offered for sale. And the NERINES OF GREENOAKS will not have to be repotted for another three or four years.

For my help, Mrs. Menninger was extremely generous in giving me a large quantity of bulbs, including at least one of nearly every variety and seedling in her collection. And as a further gesture of her bountiful good will, as I was leaving one day she pressed into my hand a glass jar full of dried tea leaves, labelled "Darjeeling, Excellent Flowery Pekoe."

I BECOME AN AMARYLLISARIAN

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I recently became interested in *Amaryllis* hybrids, and other amaryllids. I have graduated from growing Fuchsias to *Amaryllis* and have completed an 18 x 11′ lean-to greenhouse last year. My wife gave me a few Ludwig and South African grown hybrid *Amaryllis* in 1972 and I was enchanted with the results. I then discovered that in the Medical School greenhouse there were hybrid *Amaryllis.* These were started by an employee six years ago from seeds. Some were properly handled and made large bulbs. Most however had been neglected and were left in 2½″ pots. Thirty large bulbs were retained in the greenhouse, and the rest of the bulbs were given to me. These ranged from 1½″ size bulblets to some as small as six month old seedlings.

I repotted these runts last March and have kept them growing in the greenhouse. About half have grown fairly well. Many have just started making side bulblets, a few have from 8 to 9 leaves, and are about 18″ high. I am looking forward to the time when these plants will flower.

My objective now is to obtain an assortment of hybrids including the very best produced up to the present. I am also interested in a collection of species.

AMARYLLIS EXPERIENCES IN KANSAS

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My location in Kansas is 2200 feet above sea level and is blessed or scourged, as the case might be, with very changeable weather. Most of our growing seasons are extreme combinations of wet or dry, cool or hot, calm or windy. Sudden storms speed over the prairie that lash at the earth with furious lightning, dashing rains or devasting hail, Warm, moist air from the Gulf of Mexico may feed into out area, on the other hand, and soothe us with gentle rains for a week or more.

Our temperature range might be –32° F to +114° F, so growing *Amaryllis* in Kansas presents problems. Most of them are housed in a greenhouse to protect them from freezing, and large shade trees temper the hot summer sun, and a good supply of water for irrigation is needed during dry times.

My introduction to species *Amaryllis* began when I purchased some species and hybrids from Prof. William Adee. His advertisement of small, windowsill rebloomers was more than I could resist. I already had the interest as I had fallen heir to my mother's pot of *Amaryllis* (striata type) that she had blossomed regularly since I was a small child. I had purchased, of late years, some Dutch bulbs and out of curiosity, had crossed them with the ''old Mother'' bulb. I wasn't greatly impressed with the results. Though all were beautiful, there was always a sameness, as others have indicated from like experiences, they all looked much like *A. striata.*

When the bulbs I got from Prof. Adee started blooming, My temperature shot up into the danger zone and I was hooked. I cast about for a time looking for information on the *Amaryllis* family and sources of plants with which to further my collection and feed my interest. Alek Korsakoff furnished some bulbs and ''drive'' to work on the miniatures.

The American Plant Life Society came into the picture and Dr. Thomas Whitaker recommended back issues of Plant Life for my ''education.'' This was good advice. Most of my pleasure and enlightenment have come from this material and the good members I have met.

Seeds and/or pollen from Prof. Adee, Russell Manning, John Cage and Sterling Harshbarger have added to my enjoyment and expectations. Many pots carry numbers that attest to the generosity. Their kindly advice in correspondence had aided me also.

Most of my *Amaryllis* are in pots. They stay there the year around. As I write this in early fall, they will soon be brought in from under the trees, to the greenhouse for further growth, in case of the seedlings and evergreen types. The deciduous types will be left a little longer, then be brought in and stored for rest. Some of the leaves have not matured and these will be grown for a time in a cold frame. After our initial cool spell or frost, we often have mild weather with little frost up into November.

The warming and the sun in the greenhouse will trigger many of the rebloomers into blossom by November. There will be scarcely a time for the next ten months that some of these will not be in bloom. The deciduous types that rested early will be showing scapes which may be out by Christmas. Others will string along until the end of May. The peak bloom seems to be in February and March.

As long as the bulbs are doing well, repotting is done only as a last resort: to alleviate a crowded pot; to provide growing room for seedlings; or to mend accidents, broken pots etc. or to ''doctor'' sick plants. It has been a sad experience to see precious bulbs deteriorate from disturbing their habits, particularly while the plants were in the growing stage.

I have had a good degree of success with growing this year's seedlings by following the instructions as to environment, as nearly as I could, set down in Plant Life Volume 28, Page 91, by Mr. J. L. Doran. Correspondence with him also provided valuable assistance.

One lot of bulbs from Mr. Joe Sulen was bedded out for the summer. Growth has not been spectacular but they will be brought in soon and stored in peat moss per Russell Manning's instructions in Plant Life Volume 27, page 121.

My association with the American Plant Life Society has been a rewarding experience. It has given me goals and made me organize my efforts, for which I am most grateful to you all.

NEW FLORIDA AMARYLLIS GROWERS

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We purchased our first *Amaryllis* about twenty five years ago from an elderly gent living in this area, and raising Mead strain bulbs from seed. He had a plot of several hundred and we purchased a dozen. That was that so to speak for some fifteen years. These bulbs were moved to three different locations as we changed homes over the years.

About ten years ago a friend was growing *Amaryllis* and selling the blooming plants from her plot. These plants were of Dutch-Mead breeding. They were produced by using Mead as seed parents and 'White Christmas' as pollen parent. Selected offspring were used as seed parents and 'White Christmas' again pollen parent. From her plot of several hundred I purchased 18 plants as I saw blooms that appealed to me. We still have one or two of these old timers, one is red with white markings that we call 'Prolific Red', it is a fine seed parent and itself is very prolific. A large bulb has three and occasionally four scapes of bloom with four to six bloom per scape, the blooms are medium size. The scapes are usually only 12″ to 16″ and with two scapes of bloom open at once it is a bouquet and especially nice in a pot. However 'Prolific Reds' offspring seldom have this short scape and its seedlings using large flowered dutch as pollen parent are larger but quite vigorous and prolific.

Our interest was growing by leaps and bounds and many named Dutch bulbs were purchased—Van Meeuwen, Ludwig and Warmenhoven. Also bulbs of the Harrison strain as well as all the various crosses Mr. Goedert in Jacksonville, Fla. offered. We bought bulbs and seeds from Mr. Angell in California. (Thanks to Dr. Whitaker for his address) Seed were purchased from Ludwig through a U.S. firm, and we were on our way.

Our most pleasant surprise of plants obtained from seed which have bloomed were from seed purchased from Mr. Goedert of the Harrison—Dutch cross. There are about six pinks from pale shell pink which are outstanding—real pink pinks without a hint of salmon.

We bloom several hundred seedlings each year from our various crosses looking for those exceptionally fine features that warrant trying them as seed or pollen parents or both.

Here is what we look for—*Size* at least eight inches across unless all other characteristics and color are superb then seven to eight might make it but rarely. *Quantity* of bloom—at least four blooms per scape and if the bulb is of fair size at least two scapes. *Bloom* must open uniformly, no three blooms then the fourth opening alone; opposite blooms must open together. Texture of bloom must be good for a soft thin blossom will not hold up well. *Quality* of the bloom must be outstanding in form. Broad overlapping petals, good open-faced bloom (we are not particular admirers of an overly deep trumpet) D-5A or D-5B.

Blooms should be held from a ninety degree angle to stem to somewhat upfacing. You should be able to admire a bloom without having to lift it with your hand to see its face, so any droopy bloomers go out quickly without further consideration.

I believe the finest bulb we bloomed this year was a seedling of 'Rilona' and I know not the pollen parent. The first scape had eight blooms with six open the last two opening as the first pair started to fade, the second scape had six and the third four for which we forgive since it was a three year old blooming the first time from approx. a 30 cm. bulb. The color was much deeper and brighter than 'Rilona', a clear salmon or salmon orange. All bloom on the first scape exceeded eight inches and the others were not much smaller. We ripened a pod of seed on this plant using pollen of a pure Dutch clone.

Other seedlings we thought that measured up were a pale clear pink; a deep rose; an outstanding white; and two reds, one a bright scarlet the other a very dark red almost appearing black in the throat and veins.

We grow our bulbs entirely in the ground. We usually start digging, dipping and drying before placing in cold storage around the first of December and try to finish by the first of January. We begin potting bulbs the first of the year at the same time that we start shipping. We continue potting and shipping dry bulbs until the first of April or until we run out of bulbs which has happened the last two years.

All bulbs to be kept for growing another year (the two year olds) we try to get back in the ground the first part of March. It is about this time things get more than hectic and the ''hurrier we go the behinder we get.''

Bulbs are planted in the ground with about half of the neck exposed, and in pots with about a third of the bulb exposed. We pot in a peat, perlite vermiculite mixture with gravel in the bottom of six inch clay pots. We have used plastic pots but we do not get the root development in plastic we get in clay. Have had excellent results in styrofoam pots. I give the insulating factor the credit here. The pot never feels cold.

Fertilizing is done regularly as we can get to it, we use 8-8-8 about three or four times a season. We start the fertilizing program as soon as roots develop and blooming is finished with a light application of Ammonia Nitrate. Care is the word here—too much will burn. We use 35% nitrogen, and wind up the season in October with Potash to harden the bulb off.

EDITORIAL NOTE.—The *Shannon Amaryllis Gardens* are located in Belleview, a small community south of Ocala, Florida. They devote several acres to the breeding and growing of hybrid Amaryllis. Those interested in obtaining the Shannon Hybrid Amaryllis should write to Bill and Lois Shannon directly.

1973 ZEPHYRANTHEAE REPORT: INDUCED MUTATIONS WITH CHEMICALS

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I. INTRODUCTION

This report from your Zephyrantheae Committee is prepared from assorted technical reports and from the results of my own limited experiments. The latter are representative of what can be accomplished in a small back yard, during time stolen from the average householder's busy schedule, haphazardly supported by occasional funds for plants and supplies. My work has lately centered on the Zephyrantheae. The reasons for deciding on this program with this tribe are threefold: firstly, the Zephyrantheae exhibit a shorter time span from seed sowing to plant flowering than that of many other Amaryllids, they have relatively small space requirements, they have definitely separate periods of growth and dormancy, they do not react adversely to being lifted and handled and replanted, most set seed readily, and some exhibit pronounced and habitual parthenogenesis; secondly, controlled ''chemoalteration'' of plant characteristics results in more dramatic and faster changes in plants than result from selection for several generations of untreated seedlings; and thirdly, our knowledge of plant functions will be enhanced by additional knowledge that will be provided while viewing them under abnormal conditions rarely encountered in the natural state.

Additionally, in my own case, my love affair with the Rain Lily tribe began many years ago when as a young boy I saw my first pot of flowering *Zephyranthes rosea* in a Michigan greenhouse. At that time I stood about eye-level with the blossoms. The good Dutch grower, noticing my fixation and my straining on tiptoe, hoisted me up so I could see them better, explained to me why their Dutch name was ''West Wind Flowers'', and told me how he had grown them and brought them into flower. Then and there I decided to grow some for myself and within one year had some flowering in a pot on my mother's kitchen window sill. I have grown them periodically ever since, but have come to know many other Rain Lilies. It is now difficult for me to affirm which I like best, the exotic styling and brilliant red of an Aztec Lily *Sprekelia,* the rose pink trumpet of *Habranthus,* the pristine white of *Cooperia,* the delicate hues of other *Zephyranthes,* or the deep ox-blood red of *Rhodophiala.* And since the bigeneric hybrids have begun to materialize in this tribe, a planting of *X Sydneya* sending up several glowing deep rose chalices at one time can hold one transfixed.

True, the Rain Lilies pop up without warning when you turn your back, and they last only a day or so, but like many other fleeting things, they are incredibly beautiful. My first attempts at ''chemoalteration'' were rudimentary and generally unsuccessful. Lately, however, study of my results, and additional reading of published material have been very helpful to me. To provide you with a summary perspective of this general subject, we'll next consider the history and methods of ''chemoalteration'' of plants—all plants—and then will discuss some results achieved with Zephyrantheae.

II. HISTORY

Several plant ''chemoalteration'' (induced mutation) techniques have progressed from crude experiments to a status of standardized methodology. Plant growers and breeders have for the past approximately fifty years used unusual chemicals in powder and liquid forms to improve the rooting of cuttings and bulblets, to reduce the drop of seed capsules (pods, berries, fruit) prior to maturation, and to induce changes in the chromosome numbers and arrangements in somatic and germ cells. Much work has been done with chemical mutations of grains, fruit trees and herbaceous perennials, as well as with decorative flowering biennials and annuals. Reports on techniques and results in these areas are plentiful. However, knowledge of ''chemoalteration'' of bulbous plants is comparatively limited, and technical literature on this subject seems scarce. To try to review one aspect at a time, this report will be categorized to cover some of the accumulated knowledge of the general field mutations induced with colchicine, and then will extend into other areas where chemicals have been used in other ways for other purposes.

A. Mutations in General

Several excellent summaries of the fundamental character of mutations, both naturally occurring and chemically induced, are available for review. In addition, there is much literature available on specific aspects of the cytology of mutants, such as the characteristics used in evaluation of the degree and nature of mutations.

Dermen, who has been working in this field since 1938, has presented at least one comprehensive review, wherein he discusses mainly changes to the meristematic tissues of fruit sports and leaf variegations (10). It is interesting to note that he finds vegetative sports variable in permanence.

Briggs and Knowles discuss autoploidy, mainly in crop plants (8). They point out that autoploidy often does not significantly affect the morphology and physiology of a plant. However, plant organs (sepals, petals, anthers, fruits and seeds) may increase in size, and the chemical composition of a plant may be affected. Growth rate is generally less than that of diploids. Additionally, the ecological requirements, such as the heat or light-hours required for seed set, may be altered. Poor pollen production and sterility are cited as limiting factors frequently developed. But these generalizations are tempered by another: the effects of autoploidy on plant appearance or behavior cannot always be predicted, differing even with varieties within a species. The cytological behavior and genetics of autoploids are discussed, as is reversion to the diploid condition.

In summarizing the data and conclusions presented by these and other reviews, one is likely to be encouraged to try diligently to develop methods of inducing mutations in bulbous plants. There is also one last encouragement: inferior first generation polyploids do not indicate a failure of such aprogram, because an associated program of selective hybridization is likely to bring out potential improvements faster because of the ''loosening up'' of the plants' characteristics.

B. Colchicine-Induced Mutations

Avery, Johnson, Addams and Thomson summarize the history, methods and results of using colchicine to induce polyploidy (6). Methods which are usable on Zephyrantheae include seed or bulb treatment, seedling stem tip or root tip treatment, and injection into the bulb. Root growth retardation or serious damage is one of the results of direct exposure of growing tips to colchicine. The germination of treated seeds may be retarded or completely inhibited.

Traub reports on the results of his experiments with colchicine-induced polyploidy in *Hemerocallis* (19), (20). He not only demonstrated that colchicine is effective as a mutagen, but he was also among the first in producing self-fertile and/or inter-fertile colchicine-induced tretraploid *Hemerocallis* (2N=44) in the 1940's, which he named *Hemerocallis washingtonia* (Traub, 1951), a species produced in the laboratory.

Arisumi reports on many experiments and studies of colchicine-induced polyploidy in *Hemerocallis* (1), (2), (5). In one report he discusses 'Garnet Robe' which was produced by normal means in 1943. At that time no tretraploids, natural or induced, were known, all cultivars being diploid. There were some triploids in *H. fulva* L. with poor seed set a common characteristic. Therefore, when this beautiful plant was sterile as a pollen parent in many crosses, polyploidy was not at first suspected. When it was determined that 'Garnet Robe' was triploid, different approaches were tried, and it became a good seed parent with certain crosses. Successful conversion of triploids into hexaploids is also discussed. It is emphasized that all presently known tetraploid *Hemerocallis* are man-made.

III. METHODS AND RESULTS

Since it is difficult to separate descriptions of techniques associated with "chemoalteration" from descriptions of the results, both will be combined herein. Some methods and refinements were developed after the results of previous experiments indicated their need. For example, it would have been helpful in the early years of "chemoalteration" experiments if more had been known about chromosome counts and characteristics. Many of these data, which are a valuable aid to the experimenter prior to "chemoalteration" work, were derived as a result of alteration verification studies. Furthermore, improvements in chromosome study techniques indicate that some historical data required, and still require, substantiation and/or correction.

A. Chromosome Analyses

Methods of preparing root tips for examination of chromosomes vary with the individual and the plant. Flagg describes the preparation of *Zephyranthes clintae* root tips (11). Flory describes the preparation of root tips of several Zephyrantheae (13). Arisumi describes methods of preparing Daylily root tip squashes (3). Some of the equipment required and its usuage are also described. In their descriptions of the results of their counts, they delineate their methods of evaluating and classifying the characteristics of chromosomes, and suggest linkage between some of these characteristics and visible plant features or growth habits.

Flory and Flagg discuss *Habranthus* chromosomes (15). Flory discusses the chromosomes of three *Zephyranthes* (12). Flory and Bose discuss varying *Sprekelia* chromosome counts; they state that the base number may be N=30 and that the great spread of counts which they list may represent natural diploids, tetraploids, pentaploids and hexaploids. The *Zephyranthes* analyzed displayed apparent polyploidy, with N=6 probably the basic chromosome number for most species; therefore, there seem to be some octoploids occuring naturally. Cage reports that the chromosome count of the bigeneric hybrid *Sprekanthus cagei* is 2n=66 (9).

I am not qualified to recommend attempts by the average grower or breeder to perform chromosome counts. Judging by the fact that much of this work is done at the university or experimental laboratory level, it seems to require a thoroughly trained technician with precision equipment and closely controlled supplies and materials to produce valid analyses.

B. Colchicine Treatments

You may choose to pronounce colchicine as it is shown in botanical encyclopedias or by some science teachers (kahl-ke-seen), or as it is shown in some dictionaries and by most laymen (kohl-chi-seen). Either way, as a powder or solution, it is a strong alkaloid, dangerous in many ways to the human system—in short, a poison. It should not be allowed to remain on your skin—wash as soon as feasible after contacting it. In the eyes it will cause a violent inflammation and temporary blindness. Swallowed, it will cause severe internal disturbance, displaying symptoms similar to those of poisoning from arsenic. A large amount taken internally can cause a horrible death. It is extracted from the seeds and corms of *Colchicum autumnale*, the Meadow Saffron. Its chemical formula is $C_{22}H_{25}NO_6$. Historically it has been used in minute quantities to treat human gout, but it has been known since ancient times as a poison. I keep my supplies well stoppered and out of the reach of children. I employ eye droppers, syringe, long-nosed forceps or wooden chop sticks to apply the solution to seeds and bulbs. Everything is washed thoroughly after use.

Hannibal tried cutting into Amaryllid bulbs just superior to the basal plate, and treating subterminal buds with colchicine solution (17). Warping and swelling occurred in the subterminal area. On *Narcissus* the foliage warped and twisted. In two years, indications of larger cell structure or double chromosome behavior could not be detected.

Avery *et al* describe methods used to treat seeds, seedlings and older plants with colchicine (6). Seeds, before germination, were soaked in a 0.05 to 1.5 percent aqueous solution for a period of one to six days. Young seedlings were inverted so that their growing tips were immersed in a solution, and were sprayed while under a bell jar. Individual stem tips or entire young shoots of branching plants were immersed in or soaked with moistened cotton, or immersed in agar inside a capsule. A mix of colchicine and hydrous lanolin was smeared on growing tips. Also, a colchicine solution was injected into bulbs with a hypodermic syringe or into a cored hole with an eyedropper

The optimum concentration of the solution or the mix, and the optimum duration of treatment is stated to be determinable only by experiment. Nine experimental lots are suggested for treatment in solutions: 4, 6 and 24-hour treatments with 0.05, 0.1 and 0.2 percent aqueous solutions for each time period, so that at least one of these combinations might produce the desired results.

Results described are fairly well known by now: initial retarded growth or even mortality, then resumed growth that is distorted and malformed, then a gradual development of homogeneity, sometimes polyploidy. Polyploid parts display thicker stems, broader and thicker leaves, darker green leaf coloring, larger flowers and fruits, increased hairiness. The miscroscope must be used to detect the only truly reliable criteria of polyploidy: larger pollen grains, larger leaf and stem stomata, multiple chromosome counts. Many of the widely publicized developments in improved farm products and ornamental plants are listed. Uses of induced polyploids in plant breeding are described.

Traub worked with *Hemerocallis* ramets obtained by fractional stem cuttage (19). He soaked the roots for eight hours in a colchicine solution (7 AM to 3 PM), then rinsed them in running tap water and soaked them for 16 hours in tap water or a nutrient solution (3 PM to the next 7 AM); this was repeated for a total of from four to six such cycles. To determine the ploidy, in addition to stomata size, pollen size and root tip chromosome counts, he used pollen tube mitoses. He states his opinion that using the colchicine mutagen for severe treatments by absorption or hypodermic injections proved impractical on *Hemerocallis.* Some of the offspring were tetraploid. Permanency of the effects of the treatment was determinable only after two or more years.

Weil discusses the results of colchicine treatments on hybrid *Amaryllis* (22). All attempts made on flowering stems were ineffective. Injections of ¼ ml of 0.1% solution into the bud as it emerged caused aleration of the flowers: segs were thicker, with crinkled or ruffled edges. Buds which were dipped into the solution flowered on short scapes. When ¼ ml of 0.4% solution was injected in the bud, monstrosities were formed.

Traub reviews the first decade of *Hemerocallis washingtonia* (20). He found a very high mortality in tetraploids, even after maturity. Triploids were produced by crossing tetraploids with diploids.

Arisumi treated mature plants of Daylilies to induce polyploidy (1), (3), (4), (5). When analyzing polyploids he based his determinations on stomata size, pollen size and chromosome counts of roots tip cells. Triploids were converted into hexaploids, notably *Hemerocallis fulva* L. cv. 'Kwanso'. Each plant was treated six times; the treated shoot was not isolated but left to develop on the old crown; when its own roots were established, it was removed from the crown, and older roots which could have formed before the treatments were removed. He states his opinion that the probability of spontaneous polyploidy in *Hemerocallis* is very low. His studies over a period of years indicates that very few changes occur in treated plants after two years. Tetraploid crosses were generally less fertile than comparative diploid crosses. Complete tetraploids reproduced themselves without change over many years.

Flory and Phillips discuss a relationship between dwarfing or abnormal growth of *Hemerocallis washingtonia* and chromosome conditions (16). There was an apparent loss of chromosomes, possibly particular chromosomes, which resulted in aneuploid counts of $2N=38$ to 42 (normally, $2n=44$).

Traub, Buck and Lloyd report on the second decade of *Hemerocallis washingtonia* (21). The development and introduction of clones of this colchicine-induced species has expanded. Papers on improved methods for tetraploidizing are cited. Named tetraploid clones are listed, 211 clones introduced by 24 hybridizers.

My own use of colchicine has followed closely the methods suggested by Avery *et al*, modified somewhat by data extracted from the reports of *Hemerocallis* experimentation cited above. I have not injected colchicine into Zephyrantheae bulbs, preferring a treatment which will more likely affect the entire plant rather than only a portion of it. I started out soaking seeds and bulbs in colchicine solutions. The solution I used most was ½ tsp colchicine Grade A powder in one litre of tap water. After a large batch of seeds was started soaking, each 24 hours one fifth of the seeds was planted. Bulbs were either completely immersed in the solution, or were propped up by a tripod arrangement of toothpicks stuck into the bulb so that only the basal plate was in the solution. Some bulbs were completely dormant, some had started root growth, and some had also started leaf growth.

Alerations were not always discernible by visual examination, but several times results were so severe as to be disastrous. Records show that the optimum soaking time for seeds is from 24 to 48 hours. Less than 24 hours had little effect on resultant plants; more than 48 hours usually resulted in seedlings which dwindled and died. There were no signs of dwarfing in the Zephyrantheae treated. When plants from treated seeds matured, and were in turn used as seed parents, their seedlings displayed high mortality rates, and the surviving seedlings grew very slowly. As pollen parents they produced generally healthy, strong seedlings, with no signs of abnormalities, and with an apparently faster growth than is shown by untreated seedlings. To date, none of them have shown uniformly increased size and strength indicative of polyploidy.

Several *Sprekelia formosissima* mature bulbs were positioned so that their basal plates were in a colchicine solution. Root tips and pink leaf tips started to grow. After 72 hours in the solution, they were removed, rinsed in tap water and potted. All grew slowly for nine months, then gradually resumed normal growth, with one producing larger and stronger leaves than the others. Blossoming did not start until four years later, and the plant with the strongest leaves did not flower until seven years later. All flowers seemed normal except on the last plant: its scape spiralled through one complete turn in its length, the ovary was extra large, the peducle extra thick, and the flower was twisted and cocked on the scape. It would not set seed. Its pollen was used for crosses made this summer; results will be known in a few years.

Over 100 seeds each of *Habranthus andersonii* var. *roseus* and *Rhodophiala X huntiana* were soaked in a colchicine solution for five days. Germination started heavily, but the seedlings were drastically altered: instead of grassy leaves and slender roots, leaves were very short and thick, and roots were short and clubended. All died within six weeks after germination started.

Forty second-generation seeds of non-treated *Habranthus andersonii* var. *roseus* which had selfed, were soaked in solution for 3, 27, 51 and 76 hours. Only eight grew, and there were no signs of mutation. Later 35 seeds from another plant, also non-treated and selfed, were soaked for 3, 27 and 51 hours. Of the 27 which grew, none showed signs of mutation. The next generation, also selfed, has started to flower, and there are still no signs of alteration.

Of 66 *Zephyranthes citrina* seeds which were soaked in solution, none survived. Of five bulbs completely immersed in solution, only one had survived seven years later. While they were still alive, when used as seed parents, they all produced seedlings with high mortality rates. When used as a pollen parent the sole survivor produced strong offspring. One cross, onto Z. *'Kitty Clint'* produced seedlings taller and stronger than either parent, including two noticeably bright yellows which stay clear without the customary fading. They divided well, and their second generation seedlings (of which they are pollen parents) are now growing vigorously.

C. Other Chemicals

Avery *et al* also describe the usage of hormones for the rooting of cuttings, for the premature dropping of fruits, as aids to the setting of fruits without seeds, for improving seed germination and later plant growth, for weed killing, for altering the time of flowering, and for prolonging dormancy in buds (6). Other chemicals, not properly classified as hormones, were used to accelerate the breaking of dormancy in buds. The chemicals used are described, as well as techniques of application. That many of these practices can be directly useful in plant breeding is evidenced by cases cited. Bose and Flory report on treating ovaries of *Sprekelia* with 1% naphthalene acetic acid in lanolin (7). The ovary walls thickened, but seeds were few or non existent. I tried rubbing ovaries of Zephyrantheae with lanolin-naphthalene-acetamide, even into scarf-cuts and scratches; it had no visible effect on maturation of the pods.

When I sprayed ovaries with gibberellic acid aerosol solution, there was no noticeable effect on maturation of the seed pods. When I injected gibberellic acid into resting bulbs, leaf growth started in advance of untreated bulbs, but this seemed to deter flowering.

In a report by the National Advisory Cancer Council, it is stated that an abundant supply of folic acid is required by the developing human embryo, and that if this is lacking the embryo will die (23). For a portion of a year I dusted Zephyrantheae stigma lobes with folic acid powder and treated the ovaries with a wrap-around of cotton soaked with an aqueous suspension of folic acid powder, with aluminum foil over all to retard drying of the cotton. There were no apparent effects on seed development.

Link describes many studies of *Narcissus* pollen (18). The opinion is stated that pollen tube growth may be stimulated and seed set improved by applying a small amount of boric acid 100 ppm aqueous solution to the stigma before pollenating. To some Zephyrantheae stigmas I applied a few drops of boric acid aqueous solution prior to pollenating. For a portion of a year I also dusted powdered boric acid onto stigma lobes prior to, during and after the application of pollen. In some cases I brushed the boric acid directly onto the stigma. In other cases I held a brush dipped in the powder above the stigma and lightly tapped the brush so that a cloud of powder drifted downward. In no cases were there any apparent effects on seed development.

Because of information derived from private conversations relating to the use of chemicals to promote multiple production of seed cells by animals, I began conducting experiments in 1972 using a ''fertility drug'' made for use by human females. It is ''Clomid,'' Clomiphene citrate, made by Merrell-National Laboratories, Cincinnati, Ohio. Its chemical designation is 2 - [p-(2-chloro-1,2-diphenylvinyl) phenoxy] triethylamine dihydrogen citrate. My starting and present solution is one 50 mg Clomid tablet in one-quarter litre of tap water. Potted indoor Zephyrantheae and plants in beds outdoors are treated when pollenated. From up to two days prior to applying pollen to the stigma until up to two days following the application, a piece of cotton or cleaning tissue paper is soaked with the solution and wrapped around the ovary, with a piece of aluminum foil overwrapped to retard drying.

I have also been watering a selected variety of types of Amaryllids, all potted at the start, with a solution of 300 mg Clomid (six tablets) dissolved in four litres of tap water, plus a small amount of fluid spreader. The plants on which I applied this solution, at normal watering times, were *Amaryllis petiolata, A. evansiae, A. belladonna, A. vittata, Chlidanthus fragrans,* a *Habranthus* identified as ''Clint 3646,'' [Len Doran collection D-120 N. of General Guermes, Argentina; unbloomed 1970 seedlings.] and *Pyrolirion flammea.* When some of these were transplanted to outdoor beds, this treatment was discontinued because they were hose-watered along with all other plants in the beds. For approximately six months, during last year's low-watering season from August until March, all treatment with this solution was discontinued. It has been resumed since March 1973 on some of the plants listed above. The *Amaryllis petiolata,* which had not flowered since its apparent maturity five years ago, sent up its first scape the spring after treatment was started. The *Amaryllis belladonna* flowered six weeks after treatment was started, and again three weeks later. There has been no sign of any effects on any of the other plants so treated. Seedlings from plants which have had their ovary soaked with cotton or paper will be flowering in the next few years, at which time they can be observed for any visible effects.

Whether or not there are any permanent alterations to the plants as a result of these Clomid applications, I have perceived enough of a general tendency for more positive seed set, more seeds and stronger germination to warrant my continuing the use of Clomid in this manner. The test lots on which Clomid has been used are small, so that I cannot tabulate results with acceptable validity.

IV. FUTURE OBJECTIVES

I plan to repeat some of my experiments which resulted in loss of seedlings, or which caused no visible alterations. My records are complete enough to enable me to vary the treatments in specific respects. For instance, the cited reports regarding *Hemerocallis* suggest that repeated treatments of growing plants with colchicine solution, alternated with water flushings, might produce entirely different results from those achieved by a single soaking of seeds or bulbs.

Injection of colchicine solution into bulbs should probably be tried more extensively. Possibly injection of a ''fertility drug'' such as Clomid might cause drastic alterations. Further, emphasis on carrying a plant's altered character on into its second and third generation will probably be justified, in view of the tetraploid *Hemerocallis* breeding results. I now feel that I may have to hastily rogued out seedlings which were not strikingly altered by colchicine treatments.

LITERATURE CITED

1. Arisuma, T., "Colchicine-induced Tetraploid and Cytochimeral Daylilies", **Journal of Heredity,** 50: 255-261. 1964.

2. Arisumi, T., **Triploidy as a Cause of Low Fertility in 'Garnet Robe'**, U.S.D.A., **ca** 1971.

3. Arisumi, T., **Cytology and Chromosome Numbers of Modern Hemerocallis,** U.S.D.A., **ca** 1972.

4. Arisumi, T., "Stabilities of Colchicine-induced Tretraploid and Cytochimerical Daylilies", **Journal of Heredity**, 63:1. 1972.

5. Arisumi, T. and Frazier, L.C., **Cytological, Histological, and Morphological Evidence for a Colchicine-induced Hexaploid Hemerocallis,** U.S.D.A., **ca** 1970.

6. Avery, G.S., Johnson, E.B., Addoms, R.M. and Thomson, B.F., **Hormones and Horticulture,** McGraw-Hill, New York, 1947:282-300.

7. Bose, S. and Flory, W.S.Jr., "A Preliminary Study of Seed Setting in **Sprekelia formosissima** Herbert", **Plant Life,** 14: 102-107. 1958.

8. Briggs, F.N. and Knowles, P.F., **Introduction to Plant Breeding,** Rheinhold, New York, 1967: 265-281.

9. Cage, J.M., "Chromosome Number and Growth Habit of **Sprekanthus cagi", Plant Life,** 28: 72. 1972.

10. Dermen, H., "Nature of Plant Sports", **The American Horticultural Magazine,** 39: 123-173. 1960.

11. Flagg, R. O., "The **Zephyranthes clintiae** Complex. 1. Initial Report on the Somatic Chromosomes", **Plant Life,** 16: 86-92. 1960.

12. Flory, W.S., "The Chromosomes of **Zephyranthes insularum, Z. puertoricoensis** and **Z. nervosa", Plant Life,** 15: 55-63. 1959.

13. Flory, W.S., "Chromosome Diversity in Species, and in Hybrids, of Tribe **Zephyrantheae", The Nucleus,** 1968: 79-94.

14. Flory, W.S. and Bose, S., "**Sprekelia** Chromosomes", **Plant Life,** 23: 54-57. 1967.

15. Flory, W.S. and Flagg, R.O., "The Chromosomes of Three Mexican **Habranthus** Species", **Plant Life,** 15: 51-54. 1959.

16. Flory, W.S. and Phillips, R.P., "Chromosome Numbers in **Hemerocallis washingtonia** 'Static Dwarf' Plants", **Plant Life,** 24: 84-86. 1968.

17. Hannibal, L.S., "Mutations in Amaryllids", **Herbertia,** 10: 127-129. 1943.

18. Link, H.K., "A Study of Daffodil Pollen", **The Daffodil Journal,** 7: 67-84. 1970.

19. Traub, H.P., "Colchicine-induced Hemerocallis Polyploids and Their Breeding Behavior", **Plant Life,** 7: 83-116. 1951.

20. Traub, H.P., "First Decade of **Hemerocallis washingtonia,** Part 1, **Plant Life,** 15: 69-79. 1959. Part 2, 16: 111-120. 1960.

21. Traub, H.P., Buck, W.Q. and Lloyd, H.C., "The Second Decade of **Hemerocallis washingtonia** Jan. 1, 1959-Dec. 31, 1968", **Plant Life,** 29: 125-140. 1973.

22. Weil, A.T., "Effect of Colchicine on Hybrid **Amaryllis", Plant Life,** 14: 62-64. 1958.

23. **Progress Against Cancer 1969,** National Cancer Institute, Washington, D.C. 1969.

Notice: This is the second annual report from your new Zephyrantheae Committee. A general progress report is planned for 1974 and we would welcome any suggestions, questions or information. There is still much to be learned about these small bulbs; so do not hesitate to express a difference of opinion. Please address all correspondence to the Zephyrantheae Committee Chairman listed in the back of each year book of APLS. Don't forget to check this report section for names and addresses of members who wish to be contacted by other members.

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July 30, 1973

Mrs. Marcia C. Wilson, Chairman,
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NERINE COMMITTEE REPORT, 1973

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Here in Southern California, the harvest season of 1972 was especially bountiful. Grapes and late peaches outdid themselves with production, while many persimmon trees generated fruit beyond the endurance of their own branches. Nerines, too, must have been caught up in this spirit of heavy seed-making, for those which bloomed set an abundant crop. Bloom itself was only fair, but subsequent seed set was generous.

My own efforts at producing seed were met with especially gratifying success. Throughout the blooming season, I was careful to collect and store in gelatin capsules, pollens from those plants I consider my best. Once again, I had cause to be thankful for the foresight granted me when I purchased a large refrigerator rather than a medium-sized model. Alongside the two one gallon bottles of stratifying Iris seeds, the one half-gallon bottle of stratifying Daylily seeds, the pint bottle of Colchicine solution, and the bottle of mixed genera pollens, my small jar of Nerine pollens almost became the final straw on that fabled camel's back. Grumbling around the household was kept to a minimum by frequent reminders that the period for keeping this extensive collection of gardening esoterica chilly, would ''be ending soon, now.'' Even so, several sizeable hint balloons were launched to the effect that perhaps a refrigerator ''just for gardening things'' ought to be purchased. Fortunately, the stratifying Daylily seeds were removed from cold storage and planted just as the small jar of Nerine pollens became a large jar. The substitution was never noticed.

The routine of gathering the tiny pollen grains on a moistened artist's brush and dabbing them onto all the opened stigmas—and repeating the process day after day on each stigma—became a ritual which assumed precedence over all others. This discipline paid off, however, as soon as those first heavy-laden seed capsules began to split revealing numerous, plump, green seeds.

One of the pleasant surprises that fell the lot of several of us this last year, resulted from an offering which appeared on the surplus Nerine bulb list from Borde Hill Gardens of England. A listing had been made for ''Old'' hybrids and another for ''New'' hybrids. These were seedlings, I felt, but the prices in each case made it seem foolish not to try a few. So, I tried a few. Quite a few, in fact.

When these bulbs arrived and the first ones bloomed, I realized I had discovered one of those rarest of items in our modern world—a genuine bargain. Honest-to-goodness quality was evident among these seedlings.

A number of those listed as ''New'' hybrids, bloomed in shades of pink: rose-pink to salmon-pink, with all gradations in between. Several light reds showed up in this group as well. A few of the ''New'' hybrids were especially nice with plenty of head, good color, sheen, and ruffling (more about ruffling later).

The ''Old'' hybrids were, if anything, even better. Three which appeared to be identical, had flowers in an unique shade of red-purple with copper undertones that changed as two-toned fabrics will when viewed from different angles. Substance was good in these, and, along with their other fine characteristics, the ruffling was beautiful. These three came tall and would have been nice for cutting, had I not used them for seed production.

One of the last of these ''Old'' hybrids to bloom, came out in late October with eighteen large flowers in a magnificently shaped umbel. This one also sported nice, wide segments and beautiful ruffling. Its color bridged salmon and red. Unfortunately, it faded badly. Nevertheless, it was used to set seed with pollen from several others which should tend to offset this undesirable characteristic. Pollen from this one was used generously, as well.

Other growers who ordered these mixed hybrids—including Mrs. Eva Turnquist and Mr. Quinn Buck—reported similar good results. I know of no one who was dissatisfied with these Borde Hill offerings.

Ruffling—we Americans tend to love it in our flowers. The more the better this side of the Atlantic. So it came as a surprise to learn from Mr. Stanley Foote, one of Southern California's finest Iris growers, that many overseas flower enthusiasts tend to be lukewarm on the subject. Seems they feel we Americans have gone overboard in our ruffling demands. ''Excessive ruffling'' in ornamental hybrids rubs against the grain of flower fanciers in England, for instance, where the ''Classic'' form is preferred. This is either unruffled or only slightly waved.

When Mr. Foote told me this, I hearkened back to my Gladiolus growing days. I remembered thinking at that time how very plain the hybrids of European origin seemed. Imagine my abashment, then, to learn at this late date that they weren't plain at all, but ''Classic'' in form.

A few days after my conversation with Mr. Foote, came the second blow to my callow concepts of worldwide, homogeneous beauty standards. Mrs. Emma Menninger, owner of the Greenoaks Nerine collection, informed me that the English Nerine growers feel we Americans demand too much ruffling in our Nerines, as well. It grieves me to report this bit of news, but apparently what is going on here, and only suspicioned until now, is a behind-the-scenes ''War of the Ruffles.''

Personal tastes being what they are, I doubt if either side is going to win this particular war. Frankly, I doubt if either side ought to win. There is plenty of room for both ''Ruffled'' and ''Classic'' forms in the world of Nerine growing and hybridizing. Those of us who find pleasure in both types are the true winners.

This past year, I paid several visits to Mrs. Menninger and her extensive collection of Nerines at GREENOAKS. What a sight those blossoms are! Each year I look forward to seeing them, row upon row, glistening and sparkling in the sunlight. A heart of stone would be quickened by such overwhelming beauty.

The variety 'Ben Hills' (Exbury) was at its best during one such visit. That color is incredible!: deep rose, warm and inviting, yet elusive, always just beyond a person's ability to catch and hold it in memory. And, unlike certain varieties, bulbs of 'Ben Hills' are eager to bloom on an annual basis. To top things off, there's a regal quality about this one that sets it above the commoner sorts. If you haven't already guessed, it's one of my personal favorites.

That beautiful GREENOAKS red seedling mentioned in the 1972 Nerine Committee Report was blooming again this year, wonderful as ever. I trust this one will be named and registered before long.

'Cupid' (Exbury) was its usual charming self during the second week of October. Red and pink often seem to be at loggerheads when combined in a single Nerine flower. Not so here. The blend is right. And quite beautiful.

I caught sight of an especially charming blue seedling during one of my visits to GREENOAKS. Mrs. Menninger liked it as well, and christened it on the spot with the working name 'Blue Ruffles.' Unlike so many blue Nerines which acquire their blue coloration on aging, this one blooms blue to begin with. The hue does deepen a bit as the flowers age, but over all, the umbel is fairly consistent in color value. What I especially like about this cultivar,—apart from its size, width, umbel count, texture, color, height, . . . have I forgotten anything?—is its smoothness of color. The blues so often appear grainy, due to uneven placement of the pigment responsible for the blue color. But 'Blue Ruffles' is quite smooth. In fact, I could notice no graininess whatsoever. If one may judge from last year's performance, Mrs. Menninger has produced another fine variety.

The beautiful 'Inchmery Kate' (Exbury) was out in October, giving forth with all its usual glory. (Now here's a clone that doesn't have much ruffling, but nobody even notices much or cares at all that the frills are missing.) No hybrid Nerine collection is complete without this variety, for besides being the first recognized tetraploid, it is truly beautiful.

White Nerines are a specialty at GREENOAKS. Mrs. Menninger grows and hybridizes them in a small greenhouse set aside especially for that purpose. What a spectacle that corner of the growing area becomes when they bloom. The sparkle so often referred to which makes the surface of Nerine flowers glisten with gold and silver dust, makes the white Nerines appear to have been sprinkled with diamonds. It's no wonder so many white varieties have the word "snow" as part of their names: 'Snowfall', 'Snowflake', 'First Snow', 'Snow Man', 'Snow Maiden', 'Icicle' . . . 'Icicle'! Well, it's the same general idea, anyway.

The pure whites, those with cream and green sheaths, were spectacularly beautiful during their last blooming. And even though the subdued-color whites, those with pink or red coloring in the sheaths, did seem to exhibit a greater tendency to produce some pink down the center line than during cooler seasons, that appeared to be their only fault. It's more than likely that the excessive heat before and during their blooming period—temperatures in the 90's and 100's for days on end—had something to do with the color development.

Is there a red variety any redder than 'Miss Willmott' (Clarke)? I have seen this one described as ''orange,'' but it's certainly not orange here. Here, it is unmistakably red. Color saturation is so intense in this variety that the segments appear to be shaped out of pure red pigment. That same intensity of color saturation can also be claimed for 'Mrs. Cooper' (Clarke), although in this case, the color is an intense fuschia. Both of these are fine varieties showing that special combination of characteristics which makes for quality.

Mr. Lindsay J. Forbes has continued his most interesting communications from Australia. Mr. Forbes, an avid collector of bulbous plants, is to be commended for his success in locating, accumulating, and maintaining his impressive collection of Amaryllids and other plants, among which is the foundation of a Nerine collection anyone would be proud to display.

Much to my personal enrichment, Dr. Shuichi Hirao of Japan has written on several occasions during this past year. I sincerely hope that Dr. Hirao might honor a future edition of this yearbook with an article on the history and development of Nerines in his own country. The Japanese Nerines seem to have been developed somewhat differently from those in other parts of the worly. All who have seen them agree that they are quite good.

Mr. Zelimir K. Tvrtkovic Sahin continues to correspond, and it was an honor to meet with this knowledgeable young man on two occasions during the past year. His Nerine collection is growing rapidly, as is his storehouse of information on all aspects of plants and plant-growing.

My seedling Nerines continue to hold my fascination with the lure of their promises which can only be fulfilled in years yet to come. The seed harvest of 1970 netted me all of four seeds. I lost 25% of those, bringing the total down to three. One of these may flower for the first time this year.

By 1971, the collection had grown. And so had the seed harvest. My flowers yielded over a hundred seeds that year.

Last year's blooming season, left me with the memories of many lovely flowers, and seeds and subsequent seedlings in excess of 800.

So I'm getting near that 1,000-seedlings-a-year goal I've set for myself. And the bloom season coming due in another six weeks ought to see me well over the 1,000 seedlings mark. I shall have to use all my powers of discretion and judgment not to exceed that count by too many.

I wonder if another greenhouse could be fitted into the back yard.

1973 DAYLILY REPORT

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The year 1973 has to become a landmark in the history of the tetraploid daylilies because of several important developments: Dr. Virginia L. Peck in Tennessee had a white seedling to flower; Steve Moldovan in Ohio had picotees to flower this season; Wm. R. Munson, Jr., in Florida, had further color developments and progress in continuous blooming habit; Frank Childs in Georgia released continuous blooming clones in several colors, as well as a superlative near-white; and the whole Chicago area was reported as being simply full of amazing developments in color in the tetraploids. There probably were other major developments in other areas which have not been reported to us.

A real white has long been one of the goals of daylily breeders, and the appearance of Dr. Peck's seedling is most important. It came from a cross of a seedling Peck tetraploid with an induced tetraploid form of 'Catherine Woodberry' (Childs), fulfilling the anticipations of those who have been hoping to get white out of lavender breeding.

The appearance of narrow color borders on flower segments, in several colors, as reported by Steve Moldovan gives a new color pattern in daylilies that will be most significant in future breeding. Moldovan's Gardens also saw fine new colors and patterns in lavenders and purples derived from an induced form of 'Royal Watermark' (Moldovan).

The new purples and lavenders among James E. Marsh's seedlings in Chicago showed very great advances over those already introduced, as did also his red seedlings, most of which carried the influence of 'Douglas Dale' (Peck) added to the Marsh red lines. Clarence J. Blocher of Wheaton, Illinois, had fantastic color developments from his lines involving the lavender 'Caption' (Griesbach). Bro. Charles Reckamp at Mission Gardens flowered many more of his progressively superior melons. Similar reports came from other Chicago breeders.

Frank Childs, who has been doing line-breeding for a quarter century to get whites, this year released his diploid 'Serene Madonna', which he considers the peak of his efforts in this area; the beauty of his previous near-whites makes this an important release.

The country as a whole had a remarkably good season, although there were sporadic areas of drought scattered here and there, and certain important breeding programs were much affected. Southern California enjoyed an unusually cool season that will long be remembered for its benefits to plants and seed set, while inland Northern California had prolonged and devastating heat that ruined seed crops in some gardens and changed flowering seasons adversely. Jack S. Romine's polyploidized clones lost all their pods in Walnut Creek, Cal., while Dr. Hamilton P. Traub in coastal La Jolla, Cal., reported a fine season with many seedlings in new colors.

In the Buck garden in Arcadia, Cal., there were many new seedlings, the most interesting being "blues" derived from 'Little Wart' (Spalding), and some fine rose, pink, and wine shades from other lines.

New introductions flowered in the Buck garden in 1973 included 'Wine Bold' and 'Cherry Chin' (Peck), both very wonderful colors, but our cool nights made them open poorly. Dr. Peck's 'Highland Lass' and 'Green Glade' were delightful pastel bicolors of good form. The new Munson varieties included the lovely pink 'Queens Grace'; 'Knave', 'Chittagong', and their 'Kings Cloak' parent, all in varying shades of rose and wine; and 'Silent Spring', beautiful in shape and texture. The amazingly rapid succession of new spikes on these Munson clones is the characteristic that will be watched most carefully as the plants are in their second season and can be expected to perform even better. The bright red 'Johnny Ward' (Fay) opened well only after warm nights, and then it was good; the new pink 'Ruth Rees' (Fay) failed to bloom at all, suggesting that it may require more winter cold. 'Chicago Regal' (Marsh) was new to the Buck garden in 1973 and was amazingly handsome in size, shape, and bright bronzy purple color.

Among older varieties 'Mary Todd' (Fay) and 'Galena Moon' (Blocher) were the most outstanding performers in the yellow group; the branching of 'Galena Moon' was unsurpassed. 'Cherry Cheeks' and 'Jock Randall' (Peck) were again unrivalled in color and performance, and seedlings out of 'Jock Randall' showed inheritance of fine qualities from that super variety. 'Gypsy Laddie' (Peck) for the first time bloomed typically and normally, suggesting that the previous winter's frosts were to his liking. The established clump of 'Pink China' (Hardy) was the finest pink grown, followed closely by 'Chicago Silky' (Marsh) and 'Shell Pink' (Fay), two wonderful pink blends that performed outstandingly. A new plant of 'Douglas Dale' (Peck) did very well and set fine pods, along with 'Lusty Lealand' (Peck), probably the best of the Peck reds grown previously.

The best performing treated and induced lavender clones included 'Tai Pan' (Moldovan) and its parent 'Blue Jay' (Spalding), the shocking bright 'Fuchsia Flame' (Hardy), and heart-warming, 'Little Wart' (Spalding). 'Silver Shadows' (Munson), with its large greenish yellow throat and heavy substance, has become a very different lavender in its treated version. The best treated "whites" included two MacMillan clones, 'Robert Way Schlumpf' and 'WhCr-135-66'; treated 'Whie Frost' (Gore) performed extremely well and set seed easily. Treated 'Pres. Giles', 'Sholom', and 'William Munson', all MacMillan clones, were wonderful by comparison with untreated diploid forms.

And so, 1973 was truly another good year for those deeply interested in growing daylilies!

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THE GARDENER AND THE SWEATING DISEASE OF WRIST WATCHES

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I. INTRODUCTION

It is symptomatic of the times that a ''wrist watch'' is defined as ''a small watch attached to a bracelet or strap to fasten about the wrist,'' and that the phrase ''pocket watch'' does not appear at all in the latest edition of the Merriam-Webster ''New Collegiate Dictionary.'' History records that for the human male, the pocket watch was housed in a special pocket provided for it with an opening on the upper front rim of the trousers. However, since the late 1950's this pocket has disappeared and provision is no longer made for housing the time piece in the male clothing attire. He is expected to make use of the wrist watch only.

Unfortunately, manual labor, including many gardening operations—hoeing, weeding, fertilizing, etc., results in increased bodily perspiration, including the wrists, and thus the under side of the wrist watch band is excessively moistened. This is unsanitary to say the least, and if the truth is told, will in many cases cause an allergic reaction, ''The wrist watch allergy of man,'' a very irritating rash or allergy under and near the wrist watch band. This allergic reaction is even caused in some cases without the increase of prespiration due to manual labor.

The retort will be made that the manual laborer should leave his wrist watch behind. But this is nonsense since there is need for keeping time even if one is engaged in manual labor. One is driven to the conclusion that it is fashionable to forget about manual labor, and design clothing only for those who will wear these effeminate wrist watches. The retort is also made that the wrist watch came into use so that the automobile driver could easily read the time. But riding in automobiles is not the healthy way for a human to use his time. It is obvious that he should get on his hind legs and function as nature intended. In other words, the wrist watch should be available for all who want it, but for normal activity, away from the automobile, the pocket watch, with watch pocket on the trousers to house it, should also be available.

II. CASE HISTORY

A case history will show the seriousness of this disease. A number of years ago, a well-known Swiss brand of wrist watch was purchased. It was guaranteed to be moisture-proof. The face of the watch was of a polished alloy of metals, containing some copper. It was soon noticed that the leather watch-band caused an allergic reaction under and on the sides of the band. The writer changed to a metal-mesh band, but this too was equally effective in causing the painful unsightly allergy.

It was also noted that when the wrist watch was worn as the writer worked in his garden, the space between the face of the watch and the crystal steamed with moisture, and this could be displcaed by hanging the watch over a lighted electric light bulb for several hours.

A little later, the face of the watch made of a metal alloy containing copper as already indicated, showed extensive greenish corrosion, greatly disfiguring the face of the watch. Still later, the watch stopped working. The watch repairman indicated that the moisture had gotten into the watch mechanism. He thoroughly cleaned the watch and it functioned for a time, but again the old sweating disease made its appearance. Thus, it was no longer possible to wear the wrist watch unless one refrained from all exercise and confined oneself to a milch-toast existence.

The remedy was clear. One had to go back to the pocket watch. Luckily, he was able to obtain a fine pocket watch which a local dealer had left over from the pre-wrist watch age. This has functioned normally ever since. He is looking out for another such find so as to have a spare in case of accident. Unfortunately, clothiers, thinking that the age of the pocket watch is over, stopped placing watch pockets on trousers several years ago which made it necessary for the writer to have the tailer add such pockets on trousers.

Since many men do not prefer a milch-toast existence and will exercise vigorously, and work in their gardens, the pocket watch should be re-introduced as an added, or second watch. Let those who want wrist watches have them. And in fairness, provide pocket watches as second watches for those who need them.

III. MARKET SHOULD NOT BE RESTRICTED

Watchmakers unfortunately seem to have overlooked the sweating disease of wrist watches, and its concommitant, in a number of cases, the wrist watch band allergy. This has made it impossible for those affected to wear wrist watches. Even those who can wear wrist watches would in many cases also want pocket watches as second watches when they perform manual labor.

Watchmakers have overlooked the fact that their market has been artificially restricted, and it would apparently be increased if *both* wrist-and pocket-watches were offered in the trade. Thus, a person could have not only one, but a second type of watch at the same time. Surely, the time has arrived when one should be able to purchase both types of watches. As already indicated, this would surely rebound to the benefit of all watchmakers.

A Fifth Summary of the **VERBENACEAE, AVICENNIACEAE, STILBACEAE, DICRASTYLIDACEAE, SYMPHOREMACEAE, NYCTANTHACEAE,** and **ERIOCAULACEAE,** of the world as to Valid Taxa, Geographic Distribution, and Synonymy, by Harold N. Moldenke, Ph.D., Department of Biological Sciences, The William Paterson College of New Jersey.

This 974-page work, in two volumes, represents 42 years of research by a recognized world specialist on these plant groups, based on extensive field studies and the examination of more than 212,000 herbarium specimens deposited in 300 institutional and private collections.

5,146 specific and infraspecific taxa and hybrids are recognized in the 112 accepted genera of these 7 important plant families. A dichotomous key is provided for distinguishing the genera and the 248 subgroups. An alphabetic list of over 15,000 synonyms and other rejected scientific names, including variations in spelling and/or accreditation, forms an important part of the work. In all, 20,753 scientific names, with their proper authorities, are accounted for.

In the geographic section the known distribution of all members of these families is given by individual countries in geographic sequence. The groups being of worldwide distribution, every country of the modern world is thus treated, as well as 957 separate-islands. In all larger countries the distribution is given by states, departments, provinces, territories, counties, and/or parishes.

There is a section on the 675 species, varieties, and hybrids known to be in cultivation, the countries wherein they are cultivated, and on the 37 species known in fossil form, with their geologic horizon and location. An index is provided to all geographic areas treated, enabling the student quickly to find the area in which he is interested.

This work should be indispensable to every institution where botanical research is in progress. Price, $25.00 U.S.A. plus postage. Send orders to: MRS. HAROLD N. MOLDENKE, 303 Parkside Road, Plainfield, New Jersey 07060, U.S.A.

PLANT LIFE LIBRARY

THE COMPLETE BOOK OF HOUSEPLANTS, by Charles Marden Fitch. Hawthorn Books, Inc., New York. 1972. 308 pp., illus. $9.95 Charles Marden Fitch has come to the aid of the harassed home plant grower with an authoritative, attractive book of slightly over 300 pages, packed with much useful information about the tricky business of becoming successful with the culture of indoor plants. It is clear that Mr. Fitch is well equipped by training and experience to carry out the task he has assigned himself. His fascination with indoor plants originated in the man-made tropics of the New York Botanical Garden, which he visited many times during his formative years. Since then, he has traveled widely in the tropics, and has accumulated firsthand knowledge of tropical plants and the tropical environment. Fitch has had extensive experience in journalism and TV. This experience probably accounts for his easy, lucid style.

While the book contains specific instructions about most of the problems the neophyte houseplant buff is likely to encounter, it is much more than a cookbook. In fact, the book comes mighty close to being "the complete book of house plants" that the title implies. Fitch describes about 1000 species of plants suitable for indoor culture. The book is illustrated with over 170 black and white photographs, and 8 superb color plates Nearly all of the illustrations are the work of the author; evidently an excellent photographer.

The book commences with a discussion of the habitat of house plants, and continues with light, heat and humidity; soils and fertilizers; pots, potting and repotting; and propagation. Then follow chapters on the various species of plants used for houseplants such as bromeliads, geraniums, begonias, gesneriads, orchids, bulbs, succulents, cacti, etc. The chapter on orchids is outstanding. There is even a chapter on plants for public buildings, and a final chapter on "Keeping your plants healthy."

The book contains a short Bibliography in which a few of the standard reference works are cited. Under a chapter with the title "Helpful Lists" there is a "calendar of flowers," "plants for cool locations," "plant societies," and "sources of plants and supplies." These lists should be of much assistance to the beginner and to the serious amateur. There is an Index of 14 pages.

One feature of the book annoys me, and may have the same effect on other users of the book. The illustrations are unnumbered, hence not correlated with the material in the text. For example, **Lantana montevidensis** is mentioned on page 106 under "Shrubs for baskets," but a photograph of the plant does not appear until page 115. This difficulty is somewhat alleviated by assembling the photographs at the terminal portion of each chapter.

The book is a bargain at $9.95, and should be on the shelf of all lovers of houseplants. It may even strike an effective blow at the makers of those horrible plastic plants and flowers by demonstrating that real plants are not all that hard to grow.—**Thomas W. Whitaker.**

FLORA EUROPAEA, VOL. 3. DIAPENSIACEAE TO MYOPORACEAE. Edited by T. C. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters & D. A. Webb. Cambridge University Press, American Branch, 32 E. 57th St., New York, N.Y. 10022. **1973.** Pp. xxix + 370 + 5 maps. $37.50. **FLORA EUROPAEA** is sponsored by the Linnean Society of London. The Editorial Committee is based in the British Isles and is supported by advisory Editors and Regional Advisers from all over Europe. In this project the national and regional floras of Europe are being synthesized for the first time. Volumes **One** and **Two** had been published in 1964 and 1969 respectively, and now Volume **Three** has appeared in 1973, and it too measures up to the very high standard set by the previous volumes. The order and circumscription of the families is that of Melchior in Engler, Syllabus der Pflanzenfamilien ed. 12 (1964).

Volume 3. **Dispensiaceae** through **Myoporaceae** is the first of two volumes on the Sympetalae. After the **Preface** and the informative **Introduction,** there follow lists of the basic and standard floras; synopsis of families **Diapensiaceae** through **Myoporaceae** included in Volume 3; key to the families of Angiospermae; explanatory notes on the text; detailed descriptions of the families, genera and species. Available evidence from morphology, geography, ecology and cyto-genetics has been taken into consideration in delimiting the species. The volume is completed with four appendices: (I) Key to the abbreviations of authors names, (II) titles of books, (III) titles of periodicals and anonymous works, cited in the text; (IV) glossary of technical terms; an Index, and five maps.

The editors and collaborators are to be congratulated on producing this outstanding example of effective international cooperation in giving to the world this reliable and exceedingly useful work. The example set has served as the model for similar cooperation in other parts of the World. Volume 4 is very highly recommended to all who are interested in vascular plants, including the professional plant scientist, the student of botany and the amateur plantsman.—Hamilton P. Traub

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FLORA OF THE PACIFIC NORTHWEST, by C. Leo Hitchcock and Arthur Cronquist. University of Washington Press, Seattle, Wash. 98105. **1973.** Pp. xix + 730. Illus. $25.00. The outstanding monumental **Vascular Plants of the Pacific Northwest** (Univ. Wash. Press, 1955-1969) in five volumes is familiar to all interested in the flora of this region. In the **Flora of the Pacific Northwest** (1973), subtitled "An illustrated Manual" the vast information in five volumes has been condensed into **a single volume** of 730 pages which surely presented an herculean task. The unique format adopted, with more than 10,000 illustrations in the left margins, has undoubtedly facilitated the condensation. The volume contains a taxonomic treatment of all the species of ferns and fern-like plants, conifers, and flowering plants native to or established in Washington, northern Oregon and Idaho, western Montana and southern British Columbia. The dicotyledons are arranged in the traditional Englerian sequence, and the monocotyledons are grouped in accord with the system of Cronquist, **The Evolution and Classification of Flowering Plants** (1968). The genera within each family are arranged alphabetically, and the species are numbered. The sequence of the species reflects the way in which it was convenient to organize the key. There is a list of abbreviations and signs used throughout the book, a synoptical and an artificial key to the families. The volume is completed by an index of all Latin and common plant names. This handy manual is very highly recommended to all interested in the plants of the Pacific Northwest.

PHYSIOLOGY OF PLANTS AND THEIR CELLS, by James A. Goss. Pergamon Press, Inc., Maxwell House, Fairview Park, Elmsford, New York 10523. **1973.** Pp. xvi + 457. Illus. $15.00. Written as "an introduction to a vast and interesting field of science" this text will serve as a beginning course in plant physiology. It will also serve as a general reference for teachers, practicing scientists, and students of biology and agriculture. The subject is developed under the headings—plant cells and nutrition, water enters the plant, distribution and function of water within the plant, mineral nutrition, photosynthesis and carbon assimilation, and entrance of energy into the cell, energy storage, utilization and loss, amino acid synthesis and metabolism, plant proteins and enzymes, regulation of metobolism, phytochemistry, function of plant membranes, intercellular communication, cell division and enlargement, plant development, longevity, senescence and death, and the relevance of plant physiology. Highly recommended to all students of plant physiology.

PLANT SUCCESSION AND INDICATORS, by Frederic Clements. Facsimile of the 1928 Edition. Hafner Press, 866 3rd Av. New York, N.Y. 10022. **1973** Pp. xvi + 453. Illus. Subtitled, "A Definitive Edition of Plant Succession and Plant Indicators," by one of the major founders of the science of ecology, this reprint is welcomed. Now all students in the field of ecology may have ready access to this important source book. The subject is discussed under the following headings: concept and causes of succession, historical summary, initial and ecesic causes, reactions, stabilization and climax, structure and units of vegetation, direction of development, classification of seres, investigation of succession, concept and history, bases and criteria, kinds of indicators, agricultural, grazing, forest indicators. Very highly recommended to all students of the timely subject of plant ecology.

EVOLUTION OF SEX IN PLANTS, by John Merle Coulter. Facsimile of the 1914 Edition. Hafner Press, 866 3rd Av., New York, N.Y. 10022. **1973.** Pp. vii + 140. Illus. This reprint of one of the classic accounts of the evolution of sex in plants will be welcomed by all. It is clearly written for both botanists and laymen. The subject is discussed under the following headings: asexual reproduction, the origin of sex, differentiation of sex, evolution of sex organs, alternation of generations, differentiation of sexual individuals, parthenogenesis and a theory of sex. Very highly recommended to all interested in botany.

SIZE AND FORM IN PLANTS, by F. O. Bower. Facsimile of the 1930 Edition. Hafner Press, 866 3rd Av., New York, N.Y. 10022. **1973.** Pp. xiv + 232. Illus. This reprint of a classic text illustrating the subject of size and form in plants on the basis of cell-size will be generally welcomed. The subject is discussed under the headings—the problem of size, Psilotales and Psilophytales, living and fossil Lycopodiales, Sphenophyllales and Equisetales, Filicales, the shoot of seed plants, roots, and plasticity of form and structure in relation to size. Highly recommended to all students of botany.

FLORA NEOTROPICA. MONOGRAPH NO. 12. CARYOCARACEAE, by Ghillean T. Prance & Marlene Freitas da Silva. Hafner Press, 866 3rd Av., New York, N.Y. 10022. **1973.** Pp. ii + 77. Illus. $8.50. This is one number of a periodical designed to present in monographic form taxonomic accounts of all plants growing within the Western Hemisphere Tropics. This number is devoted to the Caryocaraceae. Geographic, ecologic, cytologic, anatomic, morphologic, chemical and economic data available are presented as well as bibliographies, citations of species names and indices for each group treated. Monograph No. 12 is highly recommended to all who are interested in the flora of the New World Tropics.

BACTERIAL AND FUNGAL DISEASES OF PLANTS IN THE TROPICS, by George F. Weber. University of Florida Press, 15 NW 15th St., Gainesville, Fla. **1973.** Pp. xvii + 673. Illus. $22.50. This important guide to the bacterial and fungal diseases of crop plants in the tropics and subtropics by an outstanding authority will be welcomed. The text is arranged alphabetically by crop plants and includes no less than 94 economics crops. Under each crop entry the bacterial and fungus diseases are described as to symptoms and etiology together with citations to the literature. At the end of the book there is a bibliography; a list of useful periodicals; an index of host plants by common name, and by plant genus; an index of diseases arranged by crop plants, and an index to Bacteria and fungi. This very useful text is highly recommended to teachers, students, agricultural advisers, and crop growers.

PROCEEDINGS OF THE 6th BERKELEY SYMPOSIUM ON MATHEMATICAL STATISTICS AND PROBABILITY. VOL. V. 1972. DARWINIAN, NEO-DARWINIAN, AND NON-DARWINIAN EVOLUTION. Edited by Lucien M. LeCam, Jerzy Neyman & Elizabeth L. Scott. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. Pp. xvi + 269. Illus. $13.50. The purpose of this symposium is to promote research, and record the contemporary trends in thought and effort of mathematical statistics and probability with reference to Darwinian, Neo-Darwinian, and non-Darwinian evolution. The subject is developed under the following headings, Darwinian and non-Darwinian evolution theory; DNA, RNA, amino-acid sequences; population studies and evolution; and the role of theory in evolutionary studies. Very highly recommended to all who are interested in biological evolution.

BANANA DISEASES, by C. W. Wardlaw. 2nd Edition. Humanities Press, 303 Park Av. So., New York, N.Y. **1972.** Pp. xii + 878. Illus. $42.50. This second edition of a well known book by an outstanding authority is needed due to recent advances in the knowledge of banana diseases, including those of plantains and abaca. In Part I there is a full and critical account of what is known about banana and related crops diseases up to 1961, and the practical procedures for the effective control of these diseases. It is a reprint of the 1961 edition. In Part II the new material on banana diseases accumulated since 1961 is presented. The subject is treated under the headings—Botany, cultivation and non-infectious diseases; viral diseases; bacterial and fungal diseases of roots, rhizomes and pseudostems; leaf diseases; fruit diseases before and after harvesting; and the black-root complex. The new material in Part II has abundant cross references and a bibliography and index are integrated to apply to both Parts I and II. Highly recommended to all interested in the banana as a cultivated crop, and to plant pathologists and students of tropical agriculture.

PESTS OF COCOA, by P. F. Entwhistle. Humanities Press, 450 Park Av. So., New York, N.Y. 10016. **1972.** Pp. xvii + 779. Illus. $49.50. In this outstanding text all that is currently known about harmful pests in relation to a major economic tropical crop, **cocoa,** is detailed. Chapters 1 and 2 are concerned with the biology and economic importance of cocoa as a crop plant and a general consideration of insect pests.

Chapters 3 through 26 are concerned with the various pests in detail. These pests are various including **mainly insects**, but (1) virus diseases, (2) ants, termites, mites, myriapods, gastropods, (3) nematodes, and (4) birds, rodents and monkeys, also need attention. These pests are considered in detail with descriptions of the pests, their importance and control and a bibliography. Four appendices include a field guide to pest identification, conversion factors, insects affecting the Cocoa plant, and a supplementary bibliography. An author index and a general index complete the book. Highly recommended to all interested in tropical agriculture.

FUNGI IN AGRICULTURAL SOILS, by K. H. Domsch and W. Gams. Translated from the German by P. S. Hudson. Halstead Press, Div. of John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. xii + 290. Illus. $19.75. This is an important guide to the "fungi of temperate soils, containing detailed descriptions of over two hundred soil fungi isolated by the authors themselves. The descriptions are arranged alphabetically for ease of reference, and consist of brief data on the ecological, physiological and taxonomic characteristics of each fungus. The comprehensive list of references at the end of the book numbers 1600, and each reference contains the full title of the paper cited. 140 of the species described including most of the lesser known ones are well illustrated with photomicrographs and/or line drawings." Highly recommended to all concerned with the soil, including mycologists, and workers in agriculture, soil science and plant pathology.

SYSTEMIC FUNGICIDES, edited by R. W. Marsh, R. J. W. Bryde & D. Woodcock. Halstead Press, Div. of John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. xii + 321. Illus. Paperback $8.75. This timely book on **Systemic Fungicides,** including contributions from 12 outstanding authorities on the subject will be welcomed. "The development of systemic fungicides during the past decade has revolutionized one of the most important areas of agriculture—the protection of crops against plant diseases. The special feature of these fungicides is their ability to attact fungal parasites from within the plant tissues, through which they can pass without injurious effects. This mode of action has greatly increased the scope of crop protection over that provided by conventional fungicides." The book brings together and discusses the findings in 1174 scientific papers reporting recent research in many parts of the world. Very highly recommended to research workers in the field of fungicides, manufacturers of crop protection products, students of agriculture and horticulture.

PHOTOSYNTHESIS, 2nd Edition, by G. E. Fogg. American Elsevier Publ. Co., 52 Vanderbilt Av., New York. 10017. **1973.** Pp. xii + 116. Illus. Paperback $3.95. Written to meet the needs of "students just beginning the study of the subject," the author emphasizes "the integral part which photosynthesis plays in the life of plants and in the whole economy of the world." The subject is developed under the headings—background; the nature of photosynthesis, etc; supply of light, carbon dioxide and water; absorption of light; conversion of light energy; path of carbon assimilation; flexibility of photosynthesis and its interrelations with other processes; and photosynthesis and life—past, present and future. Highly recommended to students interested in plant physiology.

INSECT/PLANT RELATIONSHIP, edited by H. F. van Emden. Halsted Press, Div. John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. viii + 215. Illus. The review papers in this interdisciplinary symposium held in 1971 in London on the insect/plant relationships have been included in this stimulating book. Botanists "and entomologists, representing taxonomy, physiology. ecology, behavior, paleontology and agricultural entomology all discussed the insect/plant relationship from their distinctive points of view." The papers have been grouped under introduction: an evolutionary perspective, variety of the subject, plants and insect cycles, the evolution of the insect/plant relationship, and insect/plant relationship in population dynamics. A general discussion, and an index of contributors to discussions completes the volume. Very highly recommended to all botanists and entomologists.

TEXTBOOK OF THEORETICAL BOTANY, VOLUME 4. PLANT ECOLOGY, by R. C. McLean and W. R. Ivimey-Cook. Halsted Press, Div. John Wiley & Sons. 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. viii + 595. Illus. $28.50. This timely text was written for "university students to bridge the gap between specialist treatises and purely elementary surveys." In the first part, **Principles of Plant Ecology,** Professor McLean starts with an historical review of the subject's development during the last hundred years, and in surveying the present aims, the scope and ideas of the science attempts to answer the question 'What is Ecology.' Sociological analysis of the natural plant communities raises numerous questions, including the vexed subject of the use of statistics in the analysis of such communities and populations. These questions are fully discussed. There follows a survey of the chief plant environments and their characteristics: the sub-aerial environment, soil, and the biotic environment—the complex interactions in the plant world, and between the plant and animal worlds. Professor McLean next discusses the aquatic environment in fresh and salt waters and lastly the littoral environment of the sea beach. He gives consideration to the productive capacity of the oceans. . . . In the second part, **The Principles of Plant Geography,** the groundwork is again theoretical, with a discussion of ideas, aims, and methods. This leads naturally to a consideration of the geological background, and how the present distribution of plants and vegetation evolved. The author continues with a general analysis of plant distributions, geographical types of distribution, plant migrations and their implications, discontinuous distributions, and lastly the concept of floristic elements of the different geographical origins in the complex floras of today. A look at the influence of man on plant distribution forms the closing chapter. Very highly recommended to all interested in plant ecology and plant geography.

MICROBIOLOGY OF THE ATMOSPHERE, 2nd Edition, by P. H. Gregory. Halsted Press, Div. John Wiley & Sons, 605 3rd Av., New York, N.Y. 10016. **1973.** Pp. xxi + 377. Illus. $27.50. "The wide relevance of aerobiology—geographical distribution of organisms, plant breeding, biological warfare, space research—has not been reflected in a number of books published on the subject . . . . Dr. Gregory has devoted some thirty years' work to aerobiology. The first edition of his book, which appeared in 1960, was accepted as the first work to treat this most important branch of biology as a world-wide phenomenon . . . this new edition, whilst retaining the basic structure of the earlier volume, contains all relevant material . . . Throughout, the author emphasizes the principles underlying the applications to plant pathology, hygiene, allergy and palynology. In this second edition new chapters have been included on rain-splash dispersal, inhaled microbes in relation to respiratory infection and allergy, and on survival in the atmosphere. Of particular note are the full color illustrations showing the morphology of typical components of the air spora at a uniform magnification of 1000 times." Very highly recommended to all who are interested in aerobiology and related sciences.

PLANT LIFE LIBRARY—continued on page vi.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

1. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. **THE GENERA OF AMARYLLIDACEAE,** by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. **LINEAGICS,** by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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